HEATING AND VENTILATING

A MONTHLY MAGAZINE FOR ENGINEERS AND CONTRACTORS CONCERNED WITH THE DESIGN AND APPLICATION OF AIR CONDITIONING, REFRIGERATION, PIPING, AIR SANITATION, HEATING AND VENTILATION IN BUILDINGS

Editorial Staff

Editor
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Associate Editors
NATHAN N. WOLPERT
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Advertising Staff

Western Representative
GEORGE G. TURNER
228 North La Salle Street
Chicago 1, Ill.

Eastern Representative
HARRY J. TWINE
148 Lafayette Street
New York 13, N. Y.

Pacific Coast Representative
ROBERT H. DEIBLER
2506 W. 8th Street
Los Angeles 5, Calif.

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President
ROBERT B. LUCHARS

Vice-President and Treasurer
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PUBLISHERS OF MACHINERY & MACHINERY'S HANDBOOK
The INDUSTRIAL PRESS

THIS MONTH'S COVER

Low power rates for heating homes by electricity in the Tennessee Valley Area have been made possible by the chain of TVA dams serving hydro-electric stations. The Norris Dam, illustrated, is one of this group.

If it's power piping equipment it's in the CRANE line

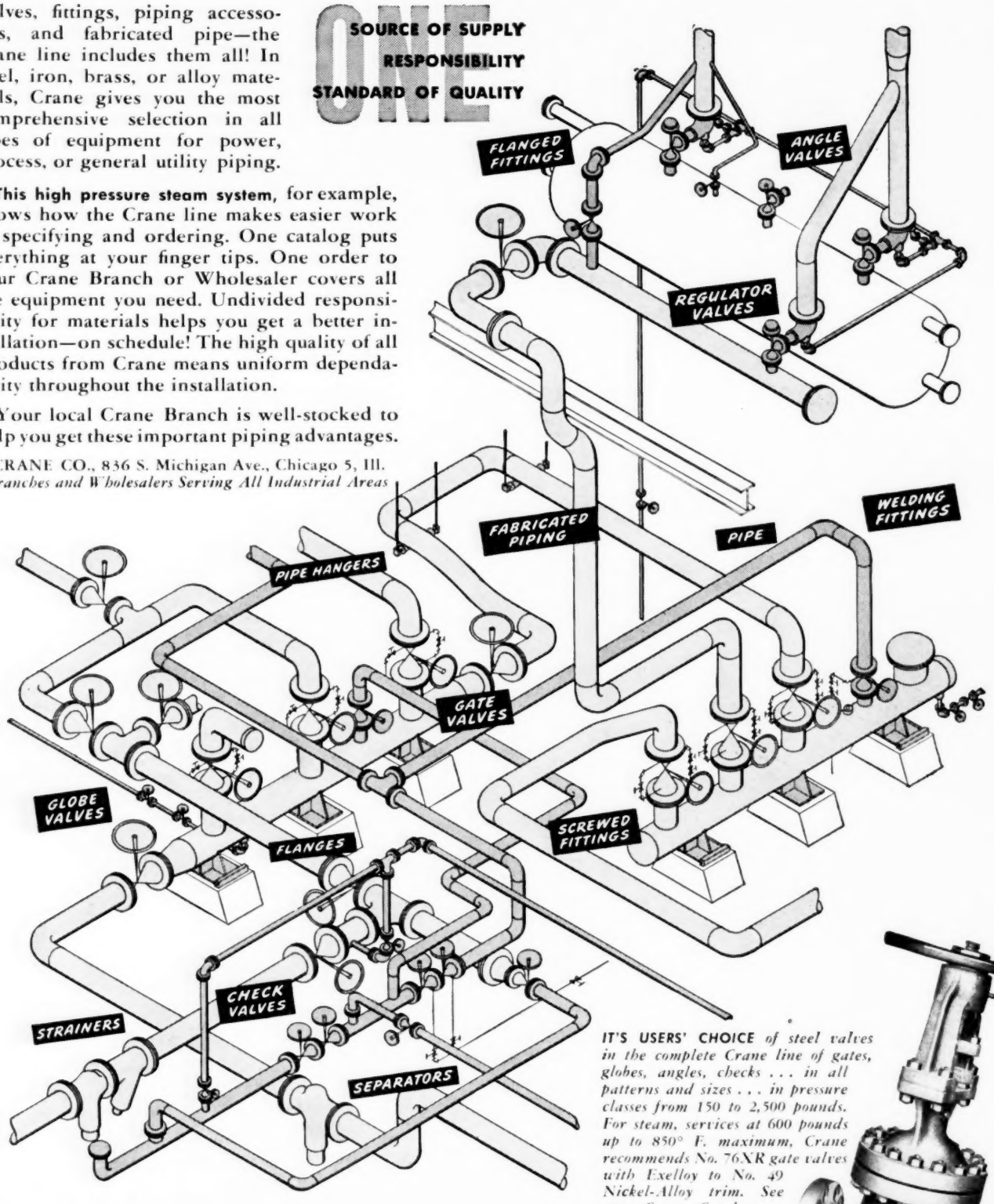
Valves, fittings, piping accessories, and fabricated pipe—the Crane line includes them all! In steel, iron, brass, or alloy materials, Crane gives you the most comprehensive selection in all types of equipment for power, process, or general utility piping.

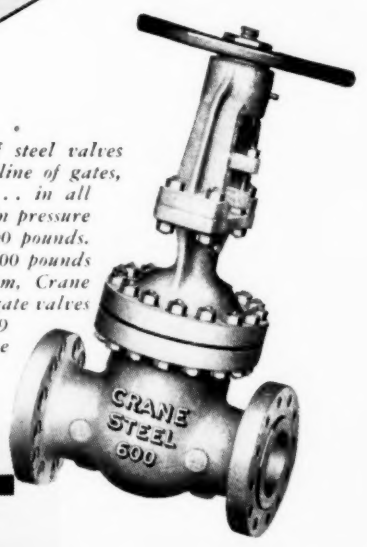
ONE SOURCE OF SUPPLY
RESPONSIBILITY
STANDARD OF QUALITY

This high pressure steam system, for example, shows how the Crane line makes easier work of specifying and ordering. One catalog puts everything at your finger tips. One order to your Crane Branch or Wholesaler covers all the equipment you need. Undivided responsibility for materials helps you get a better installation—on schedule! The high quality of all products from Crane means uniform dependability throughout the installation.

Your local Crane Branch is well-stocked to help you get these important piping advantages.

CRANE CO., 836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas





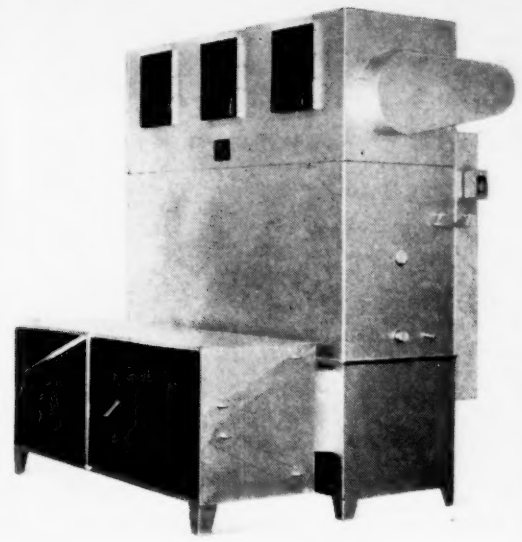
IT'S USERS' CHOICE *of steel valves in the complete Crane line of gates, globes, angles, checks . . . in all patterns and sizes . . . in pressure classes from 150 to 2,500 pounds. For steam, services at 600 pounds up to 850° F. maximum, Crane recommends No. 76XR gate valves with Exelloy to No. 49 Nickel-Alloy trim. See your Crane Catalog.*

EVERYTHING FROM . . .

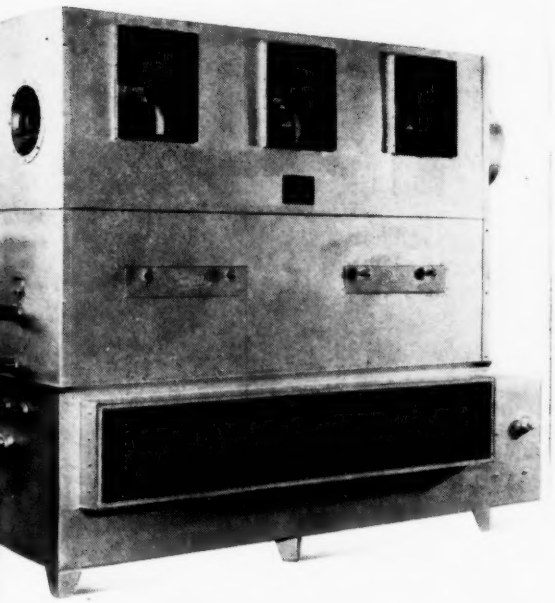
VALVES • FITTINGS
PIPE • PLUMBING
AND HEATING

CRANE

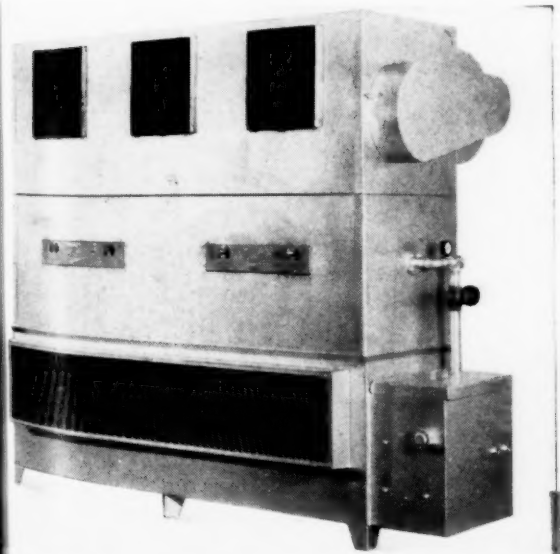
FOR EVERY PIPING SYSTEM



"Buffalo" Type "VPC" Vertical Air Conditioning Cabinets vide practically all air conditioning functions, in desired combinations. **Bulletin 3664.**



"Buffalo" Type "ECC" and "ECS" are compact, attractive ts providing efficient, economical cooling of liquids. **Bulletin 3665.**



"Buffalo" Type "EWC" Evaporative Water Coolers are al for cooling jacket water in compressors, diesels and natural gas engines, other liquids in closed systems. **Bulletin 3666.**

Three great new "Buffalo" units for Higher Efficiency Better Appearance Easier Servicing

● Result of two years of engineering, the new "Buffalo" Model "F" line gives you a complete range of standardized, sectional units for air conditioning, evaporative condensing and evaporative cooling.

Composed of three basic sections, blower-head, coil section and tank, parts are interchangeable for various types. A new very high-efficiency all-aluminum wheel provides large air volume at very low noise level.

Deliveries on these units are now being scheduled.

Write for full details and bulletins.

BUFFALO FORGE COMPANY

480 BROADWAY BUFFALO, NEW YORK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

Branch Offices in all Principal Cities

"Buffalo" TYPE "VPC" AIR CONDITIONING

CABINETS TYPE "ECC" & "ECS"

EVAPORATIVE CONDENSORS

TYPE "EWC"

WATER COOLERS

"Buffalo" for AIR CONDITIONING

A GREAT NEW COIL JOINS

TRANE Presents a Non-Freeze Coil That is Years Ahead

Here is a radically improved line of tube-within-a-tube coils. The steam distributing tubes in these new coils are equipped with ***kinetic orifices.***

These amazing orifices feed steam faster; cause condensate to be eliminated faster. Protection against freezing is multiplied. The coils are non-stratifying. There is quicker response to steam modulation. Coil capacity is sharply increased.

With an ordinary tube-within-a-tube coil, steam is released to the condensing tubes through a series of small, flush holes in the steam distributing tubes. In practical operation, steam from these small holes strikes the walls of the condensing tubes and mushrooms in all directions. This retards condensate flow; actually holds it up in the tubes. Result: the coil has seriously reduced capacity.

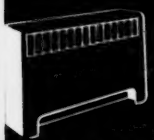
Trane's new *kinetic orifices* overcome these difficulties. Extending beyond the surface of the steam distributing tubes, they induce a jet flow of steam IN THE SAME DIRECTION THE CONDENSATE TRAVELS. Kinetic energy of the steam is imparted to the condensate, literally pushing it out of the coil, and *bringing live steam in rubbing contact with the condensing tubes.* Result: the great new line of Trane SD Coils delivers FULL STEAM CAPACITY—a capacity increase of 15% over old types—without any increase in size, weight, or price.

We sincerely believe that the announcement of this remarkable Kinetic Orifice marks the greatest advancement in non-freeze coils since the introduction of the steam distributing tube.

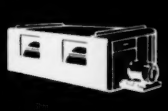
The Kinetic Orifice is an example of the constant effort of Trane engineers to keep the great Trane line of heating and air conditioning equipment in the forefront of industry. So complete is this line that architect, engineer and contractor can select the right combination for any application.

And since these products are designed together and built together for use together, a perfectly integrated, up-to-the-minute system is secured. You have a made-to-measure system; an undivided responsibility system.

You pay no price bonus for Trane products. Trane factories use modern line production, and the mass production economies are passed along to you in the form of higher quality. Over 200 Trane field engineers in 85 principal cities offer their constant co-operation. THE TRANE COMPANY, LA CROSSE, WISCONSIN. *Also:* TRANE COMPANY OF CANADA, LTD., TORONTO, ONTARIO.


CONVECTOR-RADIATORS

UNIT HEATERS


AIR CONDITIONERS

HEATING COILS

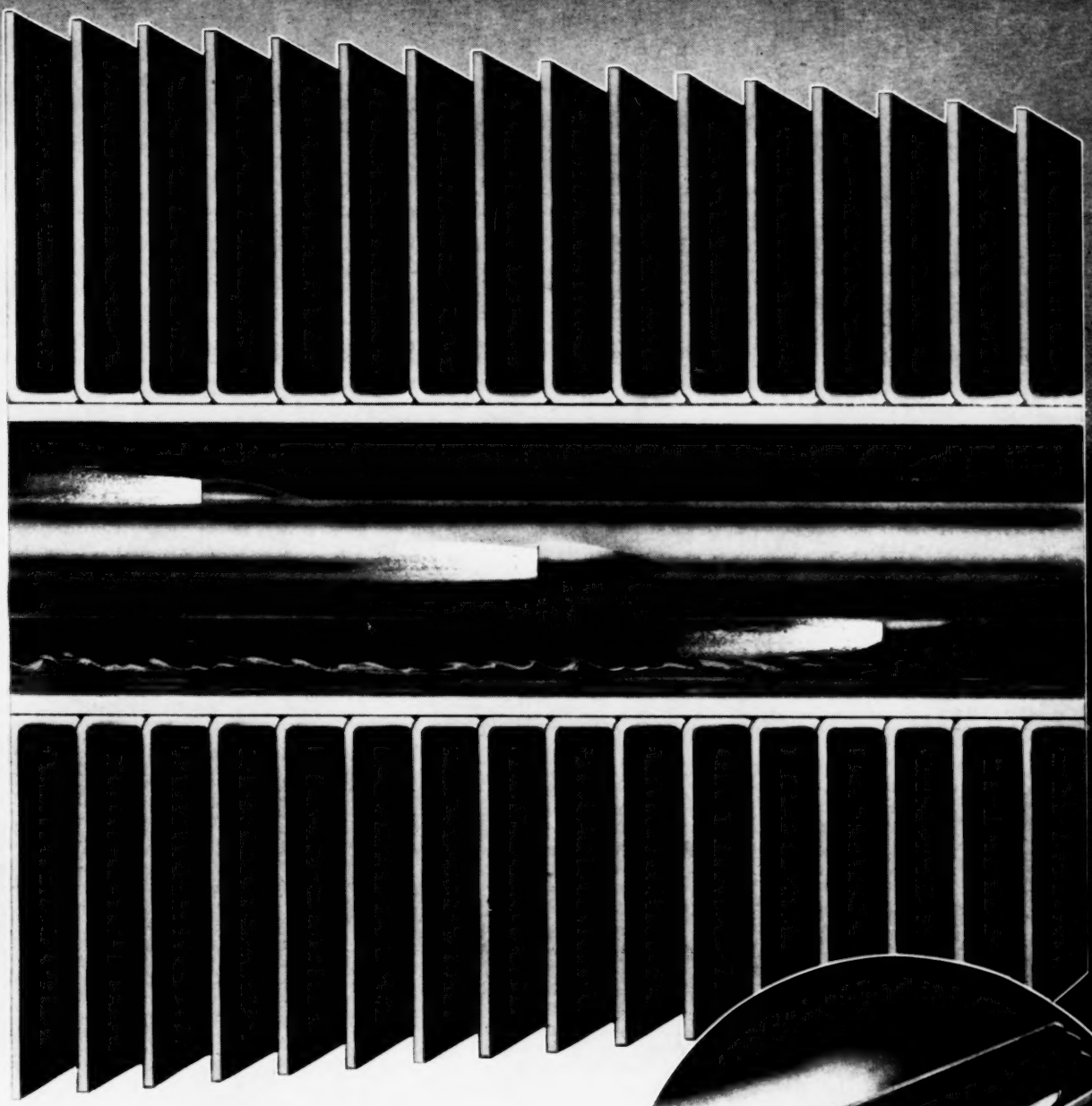
PUMPS

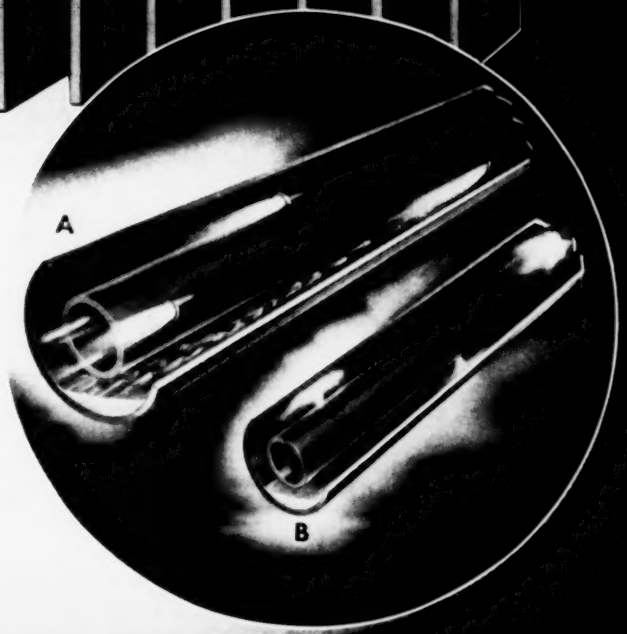
HEATING SPECIALTIES

FANS

COMPRESSORS

A GREAT LINE OF PRODUCTS





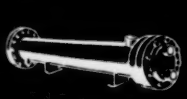
The Trane KINETIC Orifice

The Old Way: Note, at "B," how steam released from flush holes in the steam distributing tube strikes the wall of the main tube and mushrooms in *all* directions. This holds back condensate; reduces coil capacity.

The Trane Kinetic Orifice Way: Illustration "A" shows how the Trane Kinetic Orifice releases steam in the direction of condensate flow, causing positive accelerated flow. Mushrooming, stratification, freezing eliminated. Capacity increased 15% without increase in weight, size, or cost.

New Trane Kinetic Orifice Coil*: At left is shown a typical new Trane SD Coil, designed for same-end connections. A complete line of the new SD coils is available for either same-end or opposite-end connections.

*Patents Pending



HEAT EXCHANGERS

COOLING COILS

REFRIGERATION EQUIPMENT

BLOWER UNIT HEATERS

TRANE

HEATING AND AIR CONDITIONING

WORTHINGTON

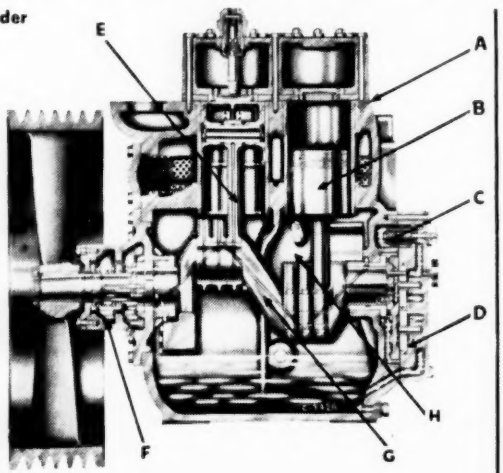
Air Conditioning and Refrigeration Report

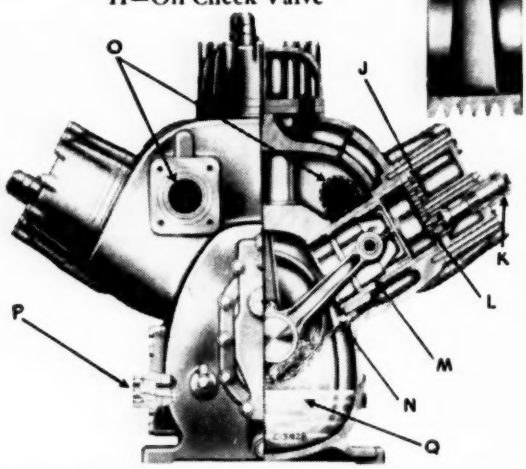
Worthington Pump & Machinery Corporation, Harrison, New Jersey

USERS REPORT LOWEST MAINTENANCE COST WITH WORTHINGTON FREON-12 COMPRESSORS

Longitudinal Section through 6-Cylinder Compressor

A—Valve Plate and Cylinder Head
B—Automotive-Type Pistons
C—Cleanable Oil Filter, Disc-Type
D—Gear-Type Oil Pump (Models 3-HF-4 and larger)
E—Forged Connecting Rods, Rifle-Drilled
F—Shaft Seal
G—Balanced Crank Shaft
H—Oil Check Valve





Transverse Section through 6-Cylinder Compressor

J—Discharge Valve
K—Suction-Valve Unloader
L—Suction Valve
M—Cylinder Liners
N—Oil Check Valve
O—Suction Strainer
P—Oil-Level Sight Glass (Wide angle vision)
Q—Large Crank Case (Exceptionally generous lubricating-oil capacity)

A number of Worthington design features are responsible for the success of Worthington single-acting, multi-cylinder compressors in providing efficient operation at very low cost for maintenance.

The famous Worthington Feather* Valve—lightest, quietest ever made—eliminates valve grinding and rarely needs replacement.

On most models, lubrication is force-fed from a self-contained gear-train-type pump driven directly by the crank shaft. A disc-type, continuously-cleanable filter keeps the oil clean.

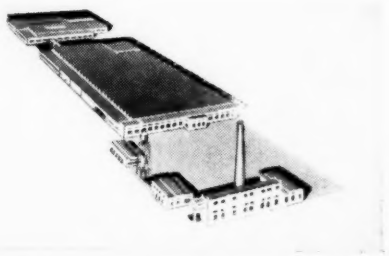
Cylinder liners in larger models are centrifugally-cast from special high-grade alloy cylinder iron having exceptionally high wearing qualities.

Main suction manifold, oil pump, oil passages and oil filters are built into the body casing, reducing the danger of leakage.

Write us for Bulletin C-1100-B30 on the complete line of Worthington Freon-12 compressors from 3 to 125 hp. *Worthington Pump and Machinery Corporation, Harrison, N. J. Specialists in air conditioning and refrigeration for more than 50 years.*

*Reg. U. S. Pat. Off.

WORTHINGTON *Air Conditioning and Refrigeration*



300-Ton Worthington Compressor Aids in Yarn Processing

At the Hopewell, Virginia plant of the famous Celanese Corporation a 300-ton Worthington refrigeration unit is used in the processing of viscose yarns.

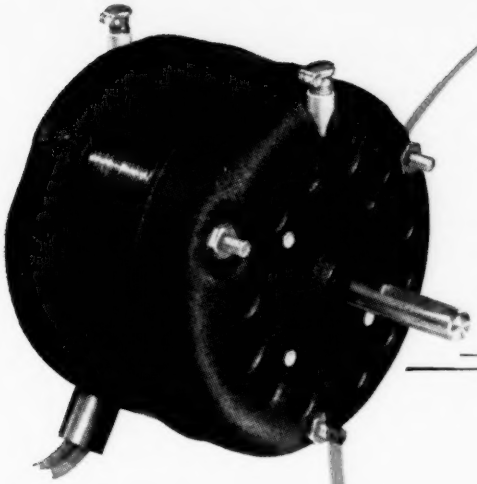
Penn Mutual Employees Work in Comfort

The Penn Mutual Life Insurance Company's main office, Independence Square, Philadelphia will be air conditioned with the help of two 350-ton centrifugal refrigeration compressors.

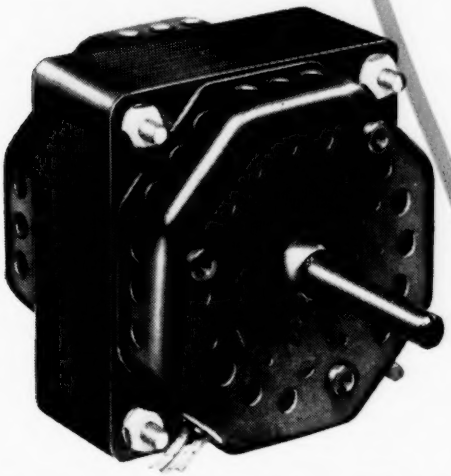
Balanced Air

An important reason for the fine performance of Worthington equipment in both large and small installations, both air conditioning and refrigeration, is the fact that every Worthington job is a *balanced* installation. All the vital parts are made by the *one* manufacturer and are carefully balanced, one with another. It adds up to smooth performance, low cost, long life—*more worth with Worthington.* See your nearby Worthington distributor (in the Classified Telephone Book) for details. AB-31

MAKE FANS GO! with alliance motors



MODEL A is a 6-pole shaded pole induction motor built especially for driving fan blades at the slower controlled speeds of from 1050 R.P.M. down to 500 R.P.M. Outstanding advantages are extreme economy in operation, even, slow running speeds, and exceptionally quiet performance. Clockwise or counterclockwise rotation, but not reversible. Approx. 1000 R.P.M. full load speed. Size 4½" O.D. Semi-open or fully enclosed construction with oilers.



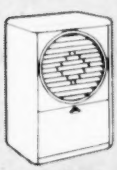
MODEL B is a 4-pole shaded pole induction motor. It is built especially for driving fan blades in unit heaters, blowers, air conditioners, air circulators and is also adapted to many other mechanical devices. Coming in three standard lamination stack thicknesses, the range of power is from 1/100th h.p. up to 1/25th h.p. Full load speed is 1550 R.P.M., maximum weight—approx. 5.6 lbs. Size 3⅜ inches square by 2⅞ inches over end brackets.

For driving fan blades in heating appliances such as space heaters, air conditioners, and air circulators, Alliance Motors are "tops". Motors like Models A and B are especially built for this purpose—they bring these big advantages:

(1) *Slower controlled speeds;* (2) *Flexible power range;* (3) *Lightweight, rugged construction;* (4) *Silent, smooth operation;* (5) *Mass production at low cost;* (6) *Operating economy.*

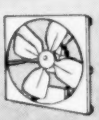
Power ratings for Alliance Fan Motors range from 1/100 h.p. up to 1/25 h.p. Speeds run from 500 to 1550 r.p.m. Motors come semi-open or fully enclosed, with or without oilers.

Drive your products to market with Alliance Motors.

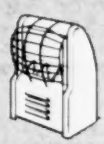


ROOM HEATER

AIR CIRCULATOR



FAN



BATHROOM UNIT HEATER

AIR CONDITIONER

WHEN YOU DESIGN—KEEP alliance motors IN MIND

ALLIANCE MANUFACTURING COMPANY • ALLIANCE, OHIO

Export Department: 401 Broadway, New York 13, N. Y., U. S. A.

A Challenge to real Americans

WHY is it necessary to sell America to Americans? One of the reasons is, not until now did the people of this country have to be shown that they lived in the most favored and most favorable country on earth. Where are the salesmen to do this job? Every community has its leaders who have this responsibility, not only to themselves, but to their families, their community and their country

The Youngstown Sheet and Tube Company

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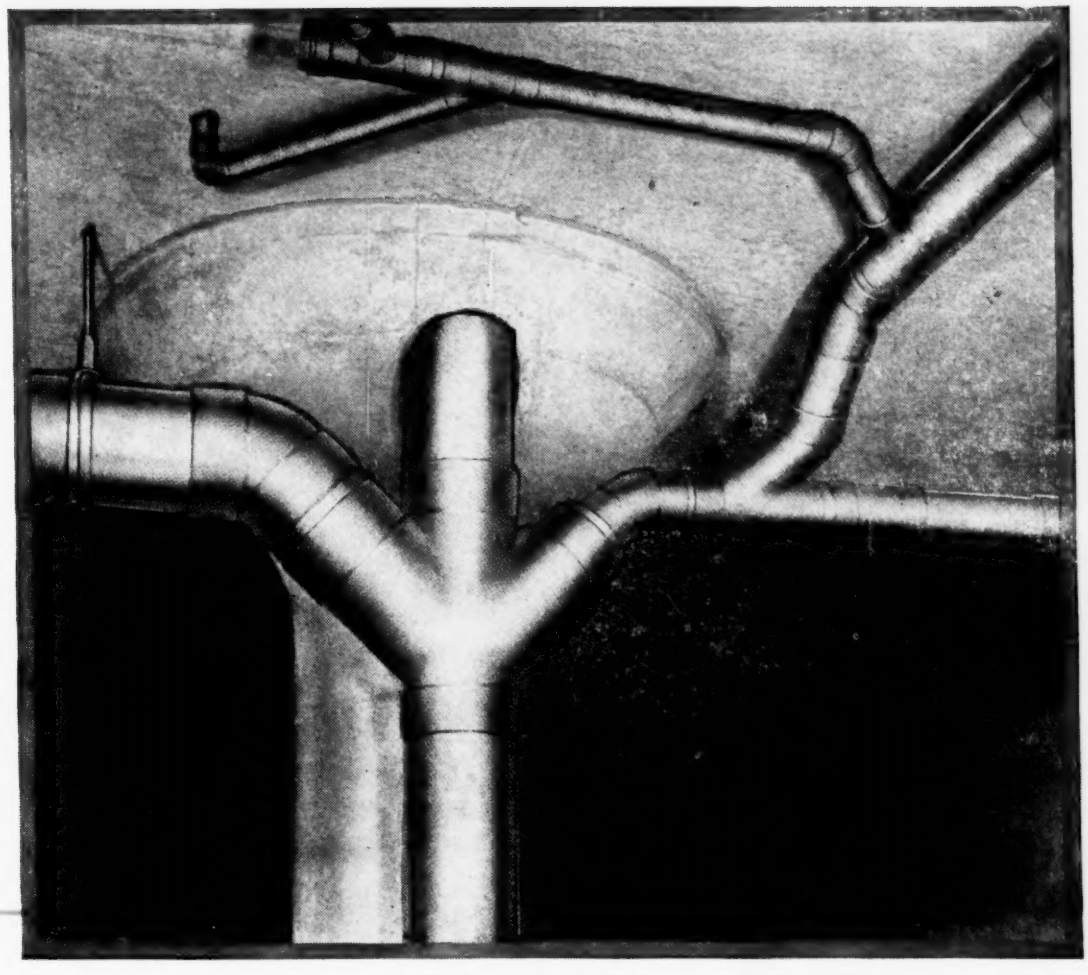
MANUFACTURERS OF CARBON ALLOY AND YOLOY STEELS

COLD FINISHED CARBON AND ALLOY BARS - SHEETS - PLATES - WIRE - TIE PLATES AND SPIKES - ELECTROLYTIC TIN PLATE - COKE TIN PLATE - PIPE AND TUBULAR PRODUCTS - CONDUIT - BARS - RODS.



ONLY Pipelines of Copper give ALL these advantages

Whether you require capillary tubing as small as .025" I.D., or process conveying lines as large as 26" I.D., Anaconda Seamless Copper Tubes offer basic advantages presented by no other single piping material.

Copper tubes are strong, rustproof, corrosion-resistant. They remain smooth and clean inside. No rusty scale can form to accumulate built-up deposits. As a result, pumping costs are lower and smaller tubes may be used, since no allowance need be figured for rust-clogging.

Modern solder-type connections eliminate threading. Strong, sound, free-flowing joints are made at lower cost and with lighter tubes. Similarly, copper tube lines can be taken down, moved or have new connections cut in faster. With soft-annealed tubes, bends may be made to clear obstructions, further reducing installation costs.

For an infinite variety of applications, there is long range economy in pipelines of copper. Anaconda Publication C-24, free on request, contains detailed information on Anaconda Copper Tubes and their many industrial uses.

Anaconda Copper Tubes are stocked by wholesale distributors from coast to coast. Types K and L in standard sizes are furnished soft in 60-ft. coils, and hard and soft in 20-ft. straight lengths. Type M Tubes 1¼" and larger are furnished hard in 20-ft. straight lengths for waste, vent and drain lines.

ANACONDA
from mine to consumer

Anaconda

COPPER TUBES

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut

Subsidiary of Anaconda Copper Mining Company

In Canada: ANACONDA AMERICAN BRASS LTD.
New Toronto, Ont.

TAKE THE GUESSWORK OUT OF SELECTING AIR CONDITIONING GRILLES *and* REGISTER SIZES

Specify... Install

T&B STANDARDS

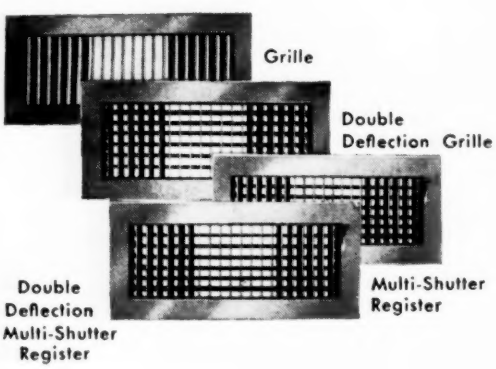
Check the size of grilles and registers you normally install for air conditioning jobs . . . then check the standard Tri-Flex and Aerovane sizes.

You'll readily see why T&B STANDARDS meet practically all requirements . . . how they eliminate haphazard selection that can be exceedingly troublesome. And there are other important advantages of standardization . . . efficient production methods mean cost savings . . . on-the-shelf stock assures quick delivery.

FOR SUPPLY

Tri-Flex

26 STANDARD SIZES



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FOR RETURN

Aerovane

20 STANDARD SIZES

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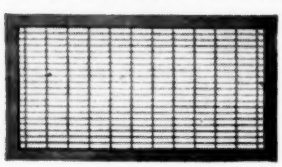
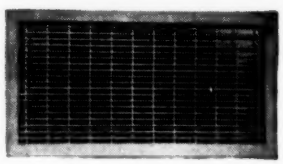


Grille



Multi-Shutter Register

FOR DETAILED DESCRIPTION, ENGINEERING DATA AND COMPLETE SELECTION INFORMATION . . . WRITE TODAY FOR A COPY OF BULLETIN 47TF.

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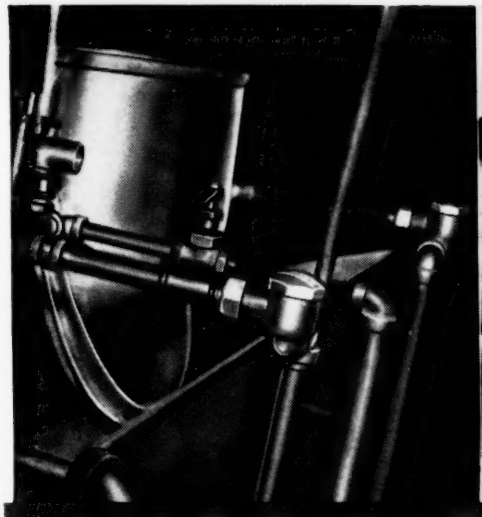
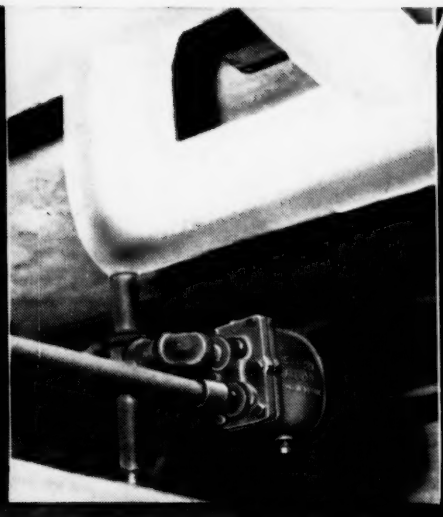
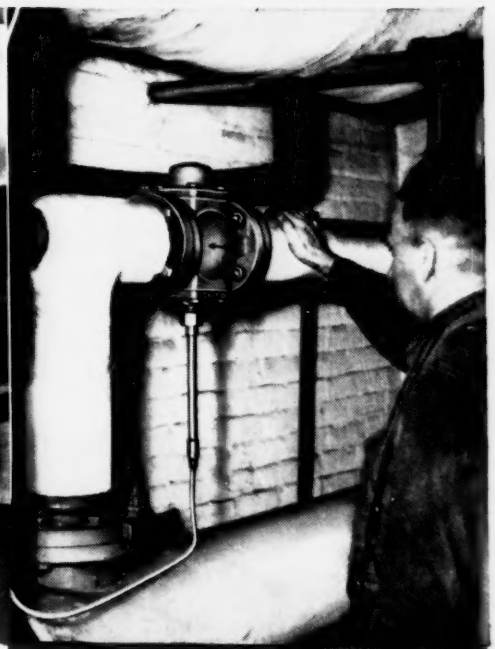






USE THIS SARCO SERVICE

The word "Sarco" means far more than a complete line of high quality steam traps and temperature controls.

It means that whenever you doubt the end-result efficiency of the fuel, heat or water you buy, or when you feel that controlled temperatures in your plant operations would speed production and reduce costs, *there is a Sarco Representative in your vicinity who can apply a quarter of a century experience on your special problems without cost for the service.*

He can show you how to get the most out of every dollar's worth of fuel in the first place — and how to use left-over heat for other purposes. If you think your boiler is not large enough, it would be wise to see that the way you are using its present output is at maximum efficiency.

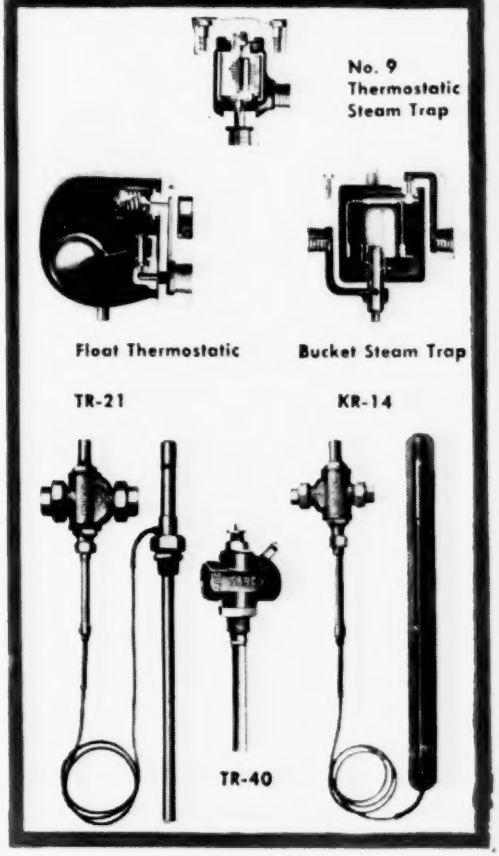
If your processes would be better with temperature control, or if your heating system is unsatisfactory, a word to Sarco will bring the help you need.

Then you will appreciate the completeness of Sarco Service and the Sarco line of products.

Seldom has industry been offered devices that cost so little and do so much — for the speed, reliability and cost of production; for the protection and comfort of employees, and for economy of fuel and water.

A phone call to "Sarco" will show you how.

As well as Sarco Steam Traps and Control



176

SARCO SAVES STEAM

SARCO COMPANY, INC.
Represented in Principal Cities
Empire State Building, New York 1, N. Y.
SARCO CANADA, LTD., TORONTO 5, ONTARIO

CHAPTER
2

THIS AUTOMATIC FEED PUNCH PRESS is one of a battery devoted to fin fabrication in the modern Marlo plant. In the flick of an eyelash it simultaneously punches dozens of holes whose diameters and spacing are accurate to 1/10,000 of an inch.

Better HEAT TRANSFER begins here — with a hole!

It's a fact. The holes in continuous fins — *precision-sized and spaced the Marlo way* — insure a perfect bond when the tubes are expanded within them. Result: more efficient heat transfer coils. (Incidentally, we can fabricate fins of any ferrous or non-ferrous metal you specify.) Tubes are available in a variety of sizes, parallel or staggered for greater efficiency.

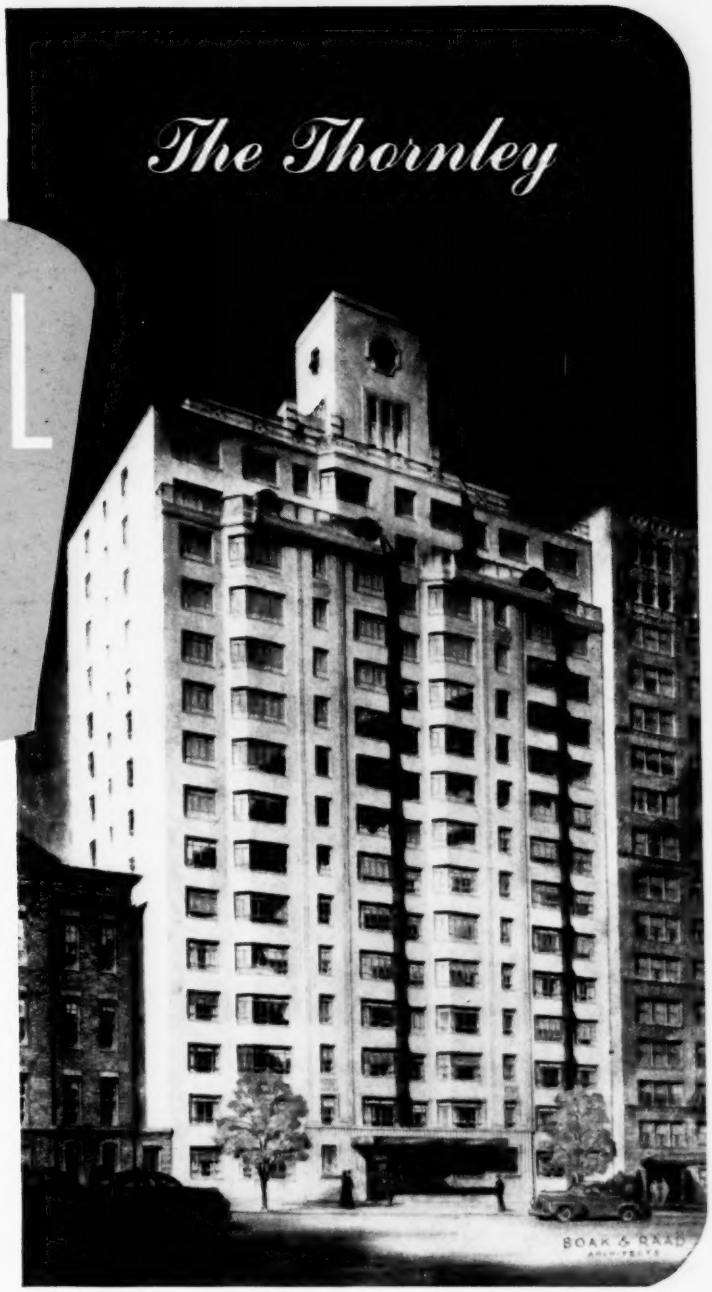
Naturally, these high-speed, accurate operations result in more efficient production, too — which means we can build more quality and value, dollar for dollar, into every Marlo product.

Marlo IS THE MARK OF HEAT TRANSFER PROGRESS

MARLO COIL CO. / ST. LOUIS 10, MO.

HONEYWELL P.H.C.*

...in each apartment



THE THORNLEY, 215 East Seventy-ninth Street, New York City, New York. Boak and Raad, New York City, *Architects*. Carty Heating Corporation, New York City, *Heating Contractor*. Thornley Realty Co., Owner; David Rose, *President*.

THE Thornley, recently completed in New York City, is one of Manhattan's finer apartment buildings. It is truly a showplace in every respect.

Embodying the most modern design and construction developments, including metallic insulation, hardwood parquet flooring throughout, dropped living rooms and independent dining bays, it is to be expected that the owner, Mr. David Rose, would want Honeywell Personalized Heating Control in each apartment.

Honeywell P. H. C.* insures rentability in years to come by permitting tenants to select and maintain their own individual temperature requirements. And just as important, if not more so, P. H. C.* eliminates waste fuel. No longer is it necessary to satisfy the "cold" tenant by overheating the entire building.

You can accomplish the same for your customers' new or existing apartments, for P.H.C.* can be easily installed in the majority of buildings. Consult your nearest Honeywell branch. Minneapolis-Honeywell, Minneapolis 8, Minnesota. In Canada: Toronto 12, Ontario.

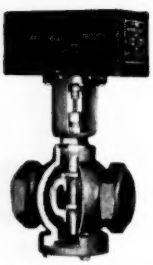
Personalized Heating Control

MINNEAPOLIS **Honeywell**
CONTROL SYSTEMS

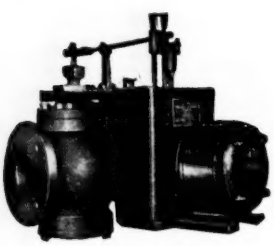
ILLINOIS *Automatic*

Steam and Fluid Control Equipment

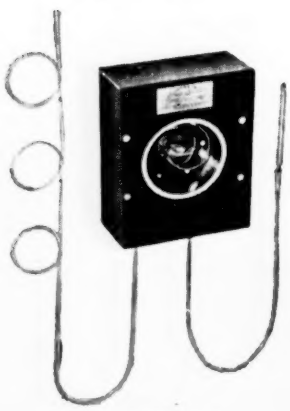
MAJESTIC RADIO AND TELEVISION CORPORATION, Elgin, Illinois
A. Epstein & Sons, Inc., Chicago, Engineers • A. J. Ironsides, Elgin, Heating Contractor



Type E-4 Valve



Type T Valve



Type E Duostat

ILLINOIS Control Systems Type E

An Illinois Type E Standard Vacuum Zone Control System assures heating comfort, fuel economy and convenience of operation in this modern daylight factory. The system is divided into four heating zones . . . two in the Administration Building and two in the Plant Offices, such as Test Room, Cafeteria, Hospital, and Personnel. Steam is generated in two high pressure boilers at 150 pounds pressure. Illinois Pressure Regulating Valves reduce this to an intermediate pressure of 70 pounds for transmission, and further down to 3 or 4 pounds operating pressure at the various stations. All radiation in the controlled sections is of the convector type. Motor operated valves . . . one located at each zone station . . . are operated by outdoor-indoor controllers and are of the cycling control type.

●

Other ILLINOIS Heating Systems include Type A Continuous Flow Control and Type C Generation Control, as well as the Standard Vacuum and Vapor Systems.

Write for bulletins

ILLINOIS ENGINEERING COMPANY
INCORPORATED 1900
RACINE AVENUE AT 21ST STREET • CHICAGO 8

Typical FAR-AIR Grease Filter installation in popular Hollywood, California, restaurant.

MODERN CLEANER SAFER KITCHENS *use* FAR-AIR® *Grease* FILTERS

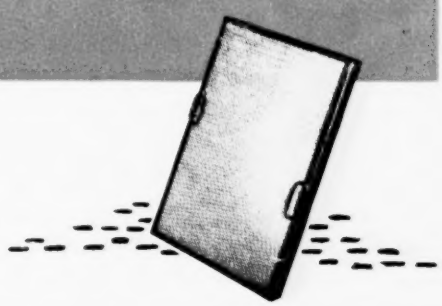
Forward-looking restaurant proprietors safeguard their investment in costly equipment . . . as well as in customer goodwill . . . by using FAR-AIR Grease Filters in their kitchen exhaust systems. This is an economically sound business precaution which involves a small initial cost and insures against severe fire loss.

FAR-AIR Grease Filters prevent deposit and accumulation of highly combustible grease in the ducts . . . reduce maintenance man-hours required for overall exhaust system cleaning . . . protect fan and blower equipment . . . provide better ventilation and sanitation.

TEST YOUR
AIR FILTERS
Yourself
Farr Company has originated a simple procedure for testing your air filters in place. Find out if your air filters are operating efficiently. Write for full information.

Among the users of FAR-AIR Grease Filters are:

Underwriters' Laboratory
F. W. Woolworth
Chrysler Corporation
Hotel Statler, Boston, Mass.
Longchamps, New York City
Earl Carroll's, Hollywood
Federal Reserve Bank of N. Y.



The advanced design of FAR-AIR Herringbone-Crimp construction facilitates "free flushing," which eliminates all grease in minutes. 16 gauge steel holding frames assure easy installation and removal of filter panels.

The FAR-AIR Catalog contains complete information on Grease Filters. Send for your copy today. Address Farr Company, Dept. G, 2615 Southwest Drive, Los Angeles 43, California.

herringbone-

corrugations

FARR COMPANY
Manufacturing Engineers

Los Angeles
Chicago • New York

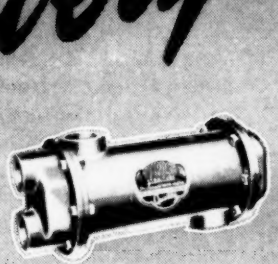
OFFICES IN PRINCIPAL CITIES OF THE UNITED STATES AND CANADA

ALL THAT YOUR CUSTOMERS WANT IN HEATING

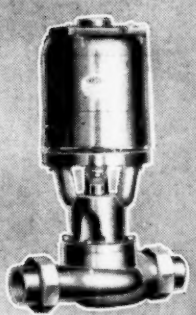
FORCED CIRCULATING
THRUSH FLOW CONTROL
SUMMER — WINTER
HOT WATER HEAT!

THRUSH System has everything

EQUIP the hot water heating plants of your customers with the finest modern automatic controls for greater efficiency, lower fuel consumption and increased heating satisfaction. This means Thrush System, with forced circulation and a plentiful, automatic supply of hot water for kitchen, laundry, and bath from the same boiler, winter or summer. Get acquainted with Thrush Equipment now if you want to build a good reputation and increase your sales. Ask your wholesaler today or address **Dept. D-5.**

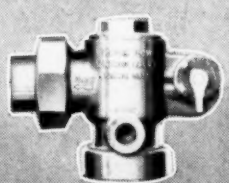


Thrush Water Heater

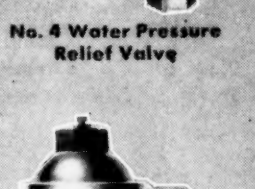


Thrush Water Circulator

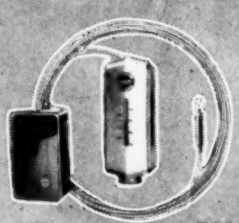
Airtight Pressure Tank



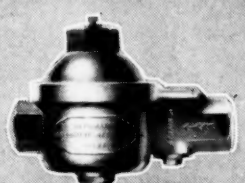
Thrush Flow Control Valve



No. 4 Water Pressure Relief Valve

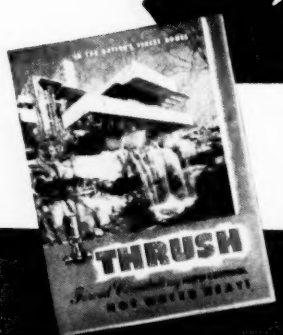


200 201
No. 201 Radiant Heat Control



No. 12 Automatic Filling Valve

WRITE FOR THIS *New* HOT WATER HEATING BOOKLET



A new sales aid that will help you sell more Thrush Systems.

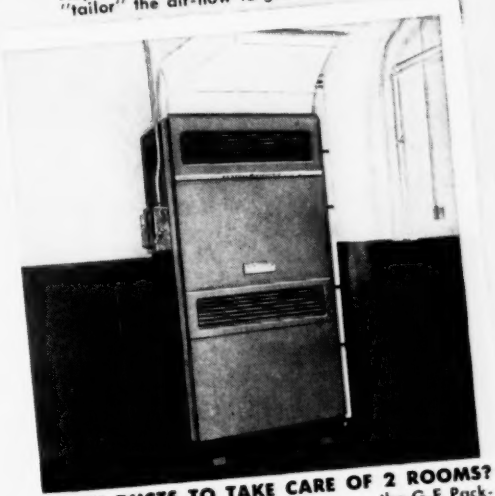
H. A. THRUSH & COMPANY PERU, INDIANA

Which Way...would you install

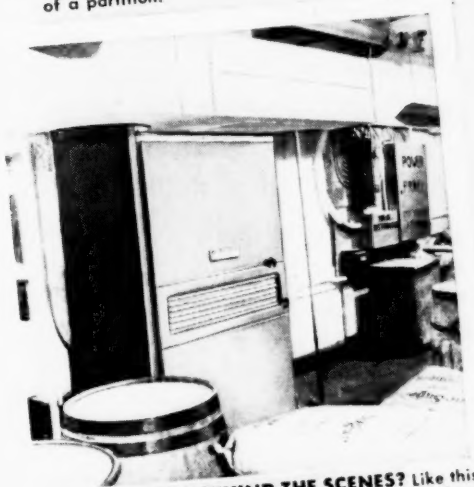
PACKAGED AIR CONDITIONING?

RIGHT OUT IN THE OPEN? Like this? Handsomely styled, decoratively correct, the trim G-E unit may be located right in the space to be conditioned. Adjustable horizontal louvers and vertical vanes "tailor" the air-flow to give even distribution.

IN AN ADJOINING ROOM? Like this? Cleverly hidden in an adjoining stock room, a compact General Electric Packaged Air Conditioner discharges conditioned air into a shop through the cutaway section of a partition.



WITH DUCTS TO TAKE CARE OF 2 ROOMS? Like this? Designed to save space . . . the G-E Packaged Air Conditioner is easily adaptable to your needs. Simple duct work effectively carries conditioned air to two or more working spaces.



TUCKED AWAY BEHIND THE SCENES? Like this? . . . Using simple duct work to distribute conditioned air, the G-E Packaged Air Conditioner may be tucked away in the basement. The G-E unit is fully automatic . . . just set the thermostat and enjoy the result.

ECONOMICAL . . . attractive . . . versatile, General Electric Packaged Air Conditioning fits in where it is needed. Customers and employees get a lift from its cool, clean air. And in winter, adding a steam coil gives the extra benefits of clean, *warm* air. For further information, see your nearest General Electric representative. Or write: General Electric Company, Air Conditioning Department, Section A8915, Bloomfield, N. J.

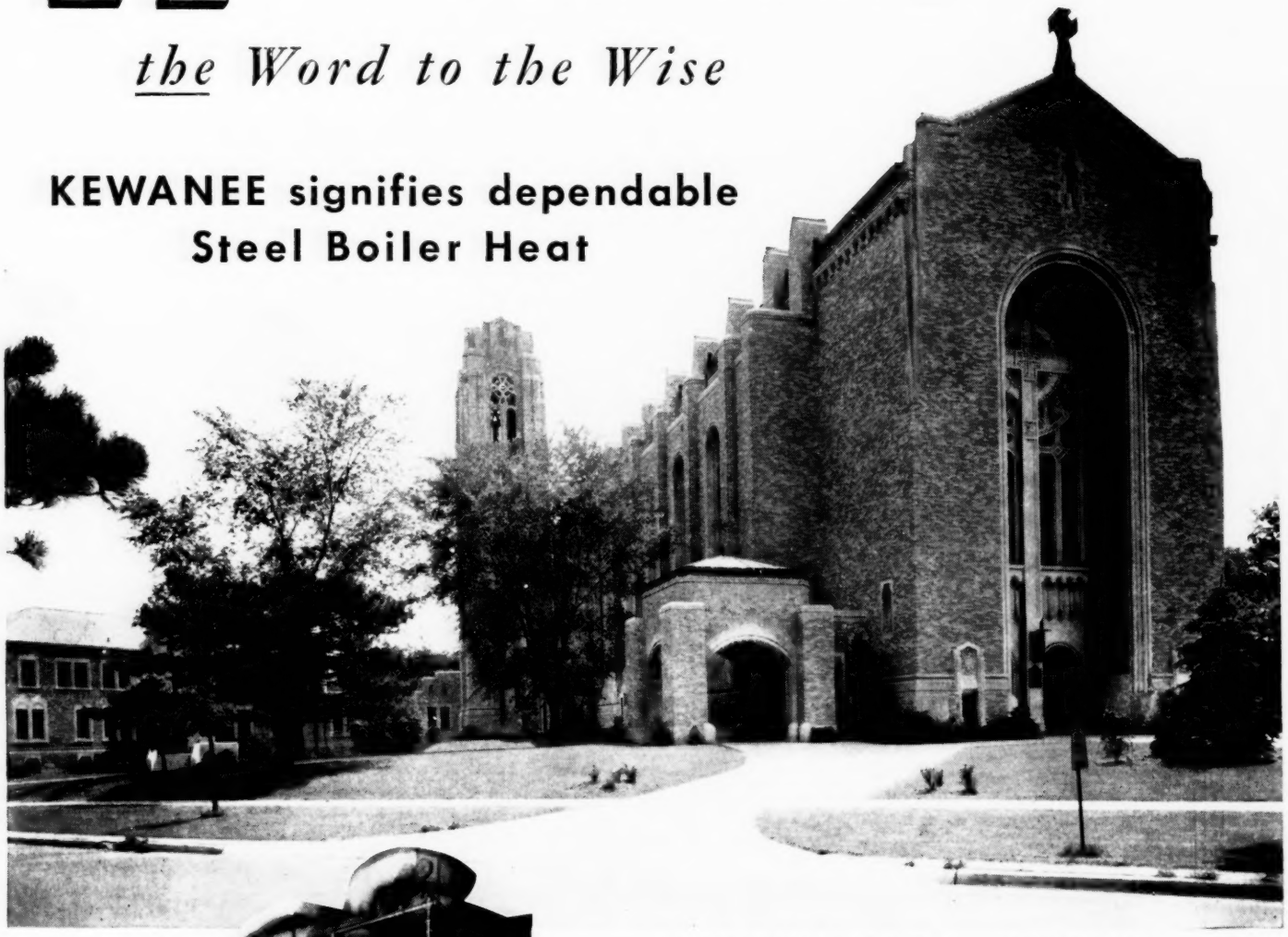
GENERAL ELECTRIC

Better Air Conditioning

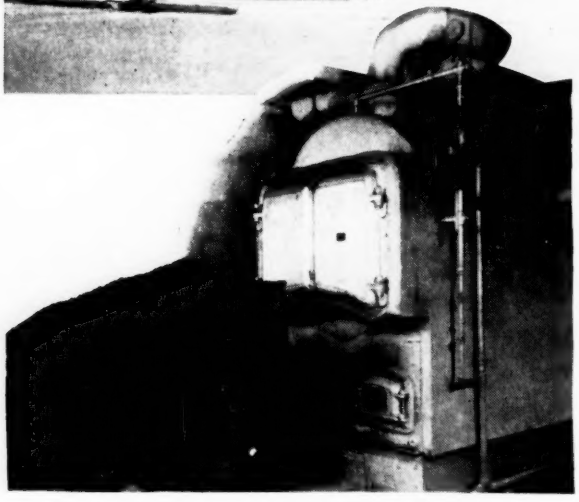
KEWANEE

the Word to the Wise

KEWANEE signifies dependable Steel Boiler Heat



St. JOSEPH CHURCH and RECTORY
Wilmette, Illinois
McCarthy, Smith and Eppig, Architects



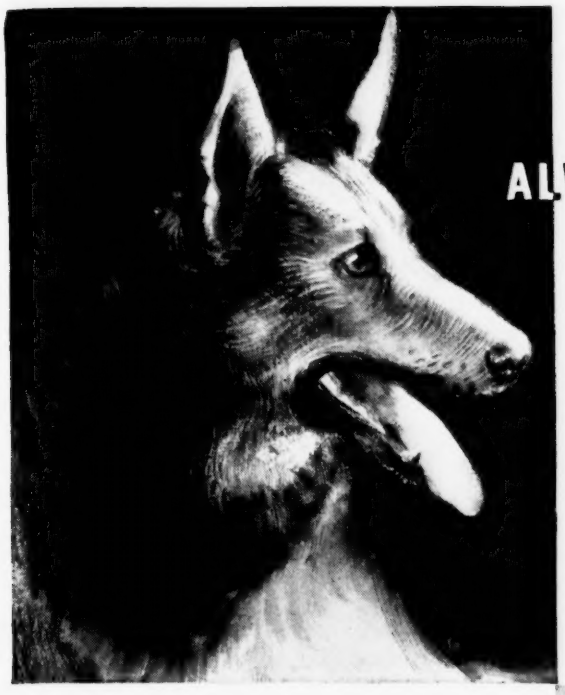
Heating Contractor Geo. A. Henrich installed the ten thousand foot Type "C" Stoker Fired, Kewanee Welded Steel Boiler

Outstanding group... Church, Rectory and School... typical of the thousands of religious edifices in which Kewanee Steel Boilers insure dependable heat at low cost.

SBI
Reg. U. S. Pat. Off.
MEMBER

KEWANEE BOILER CORPORATION
KEWANEE, ILLINOIS
Branches in 60 Cities—Eastern District Office: 40 West 40th Street, New York City 18
Division of AMERICAN RADIATOR & Standard Sanitary CORPORATION

OVER 75 YEARS BOILERMAKERS



ALWAYS ALERT TO GUARD EVAPORATOR EFFICIENCY: ALCO THERMO VALVES

The large diaphragm makes Alco Thermo Valves instantly responsive to slight changes in superheat.

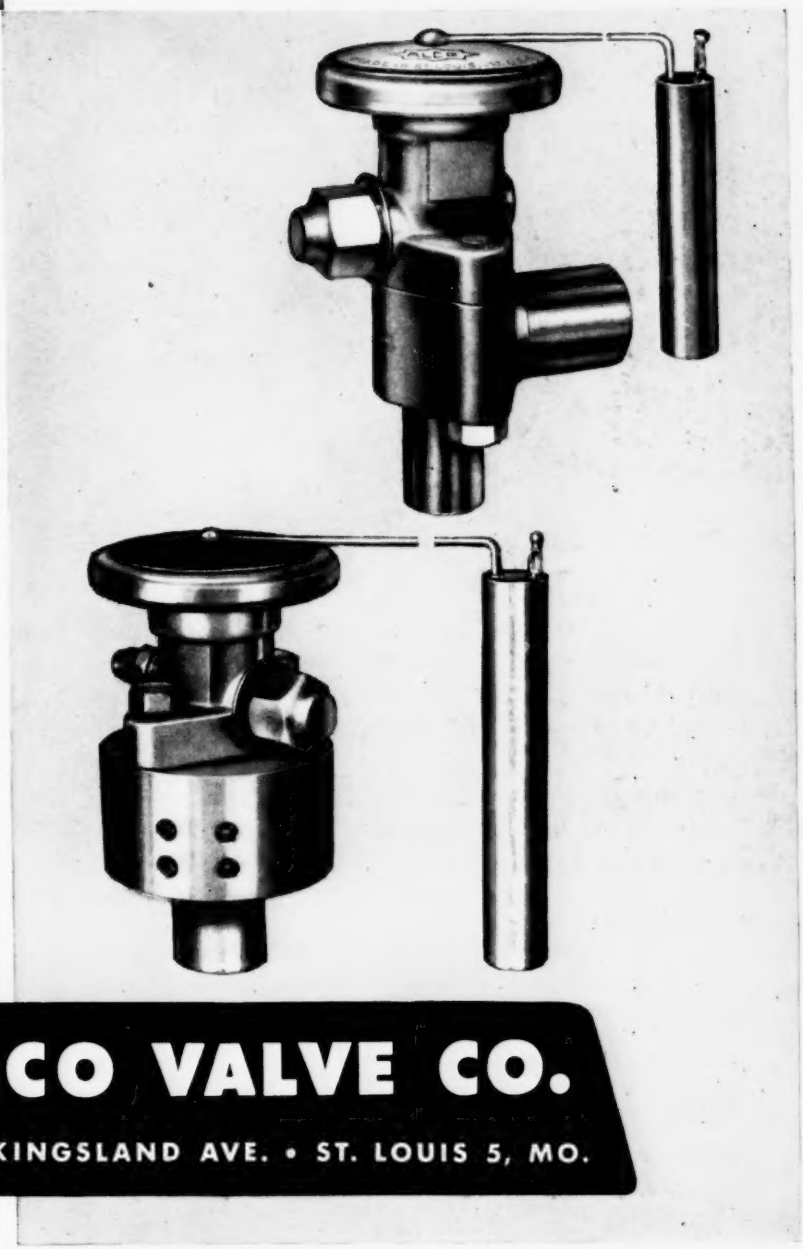
- **Precision-built for easy interchangeability of parts.**
- **Minimum moving parts for less friction, less wear.**
- **Rugged, corrosion-proof internal parts.**
- **Cupped diaphragm removes weld from flexing area—prevents loss of thermal charge.**

All these features assure a sensitive control that gives dependable service year after year.

Wide choice of capacities: ¼ to 50 tons, "Freon-12", ½ to 100 tons, methyl chloride. Multi-outlet valve gives choice of 2 to 36 outlets.

Get Bulletin 171 for single outlet, 180 for multi-outlet.

Available at your nearest Alco wholesaler.

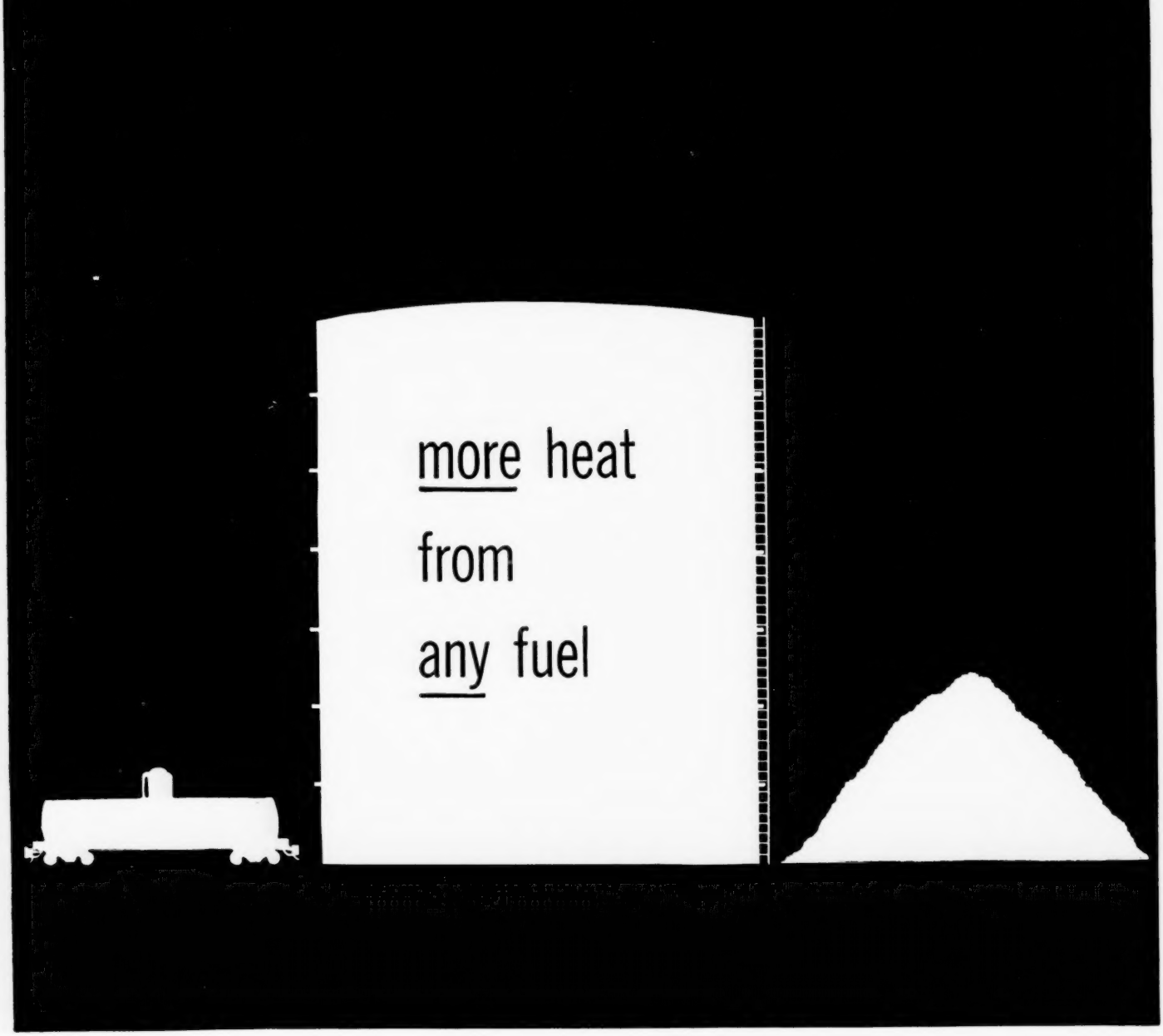


ALCO

Designers and Manufacturers of Thermostatic Expansion Valves; Evaporator Pressure Regulators; Solenoid Valves; Float Valves; Float Switches.

ALCO VALVE CO.

859 KINGSLAND AVE. • ST. LOUIS 5, MO.



Want to be sure of abundant, low-cost heat in mill, factory, warehouse or other industrial or commercial buildings? The answer is Carrier Heat Diffusers.

The scientific design of these heavy-duty standard units assures maximum heating economy. Wide uniform coverage is easy with the relatively high velocities of Carrier diffusers. Their adaptability to either low or high pressure steam or forced-circulation hot water systems has made them the choice of the largest industries.

With dynamically balanced centrifugal-type fans, belt-driven through vari-speed pulleys, a wide range of speeds and capacities is provided. Even heat distribution with efficient temperature control (manual or automatic) at full or partial loads is assured with either modulating steam valves on NON-FREEZE tube coils or by face and by-pass dampers (THERMADJUST) to regulate the volumes of heated and by-passed air.

Carrier Heat Diffusers are shipped as complete units—ready to operate. Sectional design permits floor mounting or suspension with vertical or horizontal discharge. Units are adaptable to drying and fog elimination, as well as heating. Sizes in all models available in capacities from 156,000 to 1,570,000 Btu per hour.

Like every Carrier product, these efficient, long-life heat diffusers reflect wide experience and unrivaled engineering skill. These are added values that go along with Carrier industrial heating. Carrier Corporation, Syracuse, New York.

Carrier AIR CONDITIONING • REFRIGERATION • INDUSTRIAL HEATING

Just 1 of 8

RAYTHEON PRECIPITATOR INSTALLATIONS

in Madison Square Garden

Chief Engineer Howard Post examining one of the eight 13 x 15 foot banks of dirt collector cells in the Raytheon Precipitator installation at Madison Square Garden. Consulting Engineer: Charles S. Leopold, Philadelphia, Pa.

Comprising eight units built into the air conditioning system, this Raytheon installation was made to cleanse the air and eliminate discomforting tobacco smoke haze which formerly hindered vision.

Says the Garden management, "Now our spectators can enjoy the world's greatest sporting events in greater comfort than that provided in any comparable indoor place of amusement."

INVESTIGATE the Raytheon Precipitator as the answer to your air filtering and cleaning problems.

Write for detailed information
Ask for Bulletin DL-P-503

RAYTHEON

Excellence in Electronics

RAYTHEON MANUFACTURING COMPANY

COMMERCIAL PRODUCTS DIVISION

WALTHAM 54, MASSACHUSETTS

Industrial and Commercial Electronic Equipment, Broadcast Equipment, Tubes and Accessories

Offices: Atlanta, Boston, Chicago, Cleveland, Detroit, New York, Washington, D.C.

EXPORT SALES: Raytheon Manufacturing Company, International Division, 50 Broadway, New York 4, New York

2½ Million Btu Output *calls for* HEAVY DUTY HEATING

Two five-section banks of Janitrol heavy-duty gas-fired unit heaters provide a total heat output of 2,500,000 Btu per hour for a floor area of 28,400 sq. ft., with ceiling height of 19 ft.

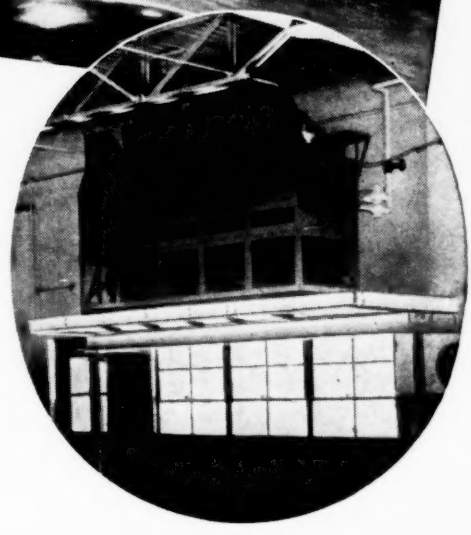
SIMPLE—but *adequate,* describes the heating system needed by the Ohio Fuel Gas Co., Toledo, for their new garage.

A major floor area of 28,400 feet, a total air volume of 539,600 cubic feet, and heat loss through two large doors at each end of the building, called for a *rugged* system, too—one with dependable, high output.

A double installation of Janitrol Heavy Duty Gas-Fired Unit Heaters with a unit at each end of the building . . . is doing the job—meeting all requirements with a total heat output of 2½ million Btu per hour.

And Janitrols are supplying quick, clean, automatic heat to thousands of other buildings—large and small—from the neighborhood beauty shop to huge industrial plants. Installations of Janitrol equipment range from one small suspended type unit with a 75,000 Btu output to the big jobs like the example above.

Your building, remodeling or expansion planning will be made easier with Janitrol Unit Heaters whatever your needs—75,000 Btu's or 2½ million. Write for complete information and specfications.

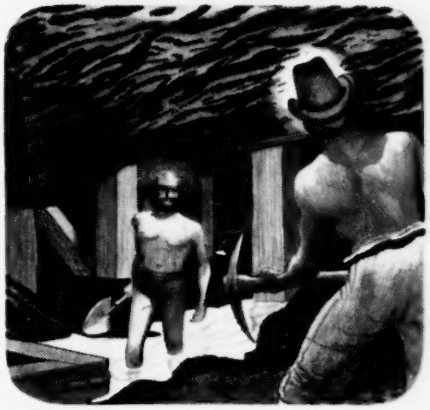


Units are located between two large doors at each end of the building to provide an air curtain when doors are opened, and for complete heating of the service floor area. With conventional floor installations too, Janitrols conserve space through compact design, and by eliminating need for fuel storage.

Janitrol

SURFACE COMBUSTION CORPORATION, TOLEDO 1, OHIO

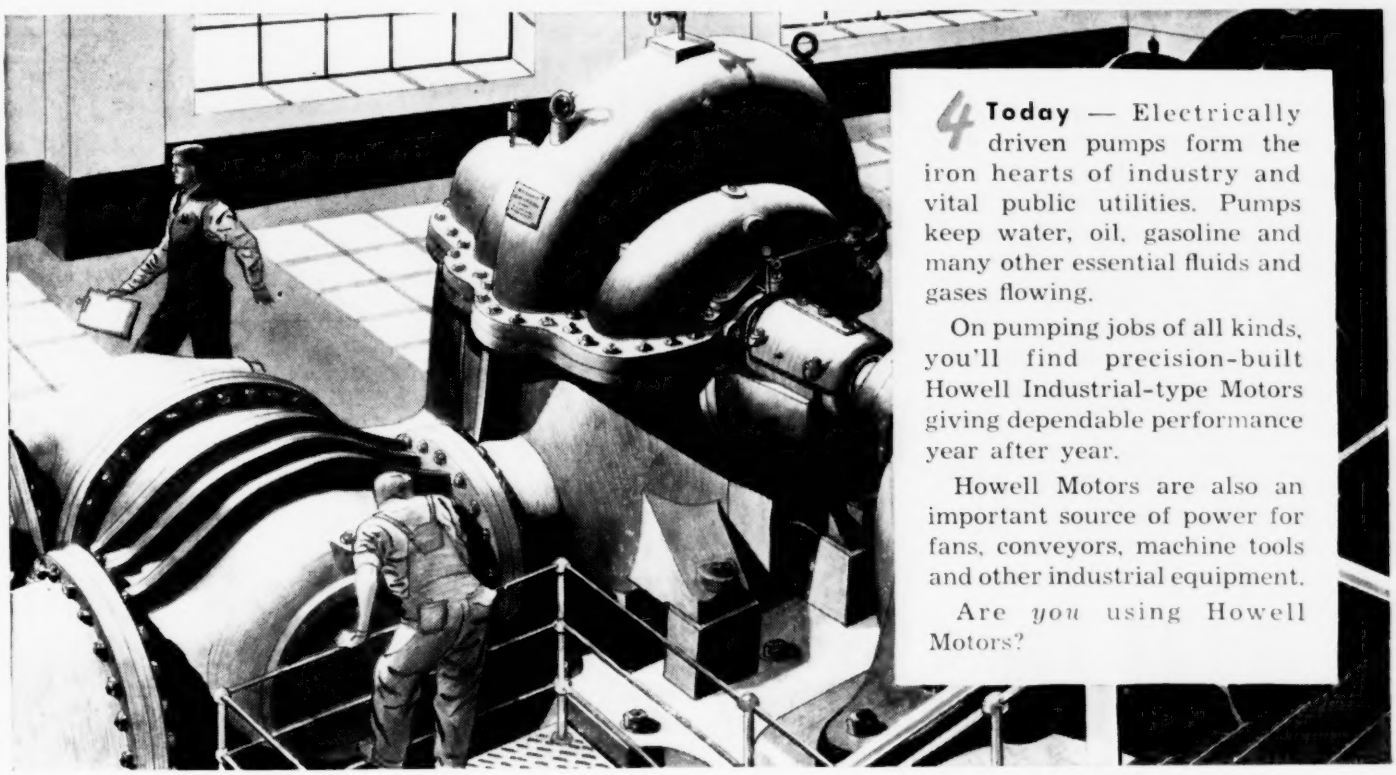
1 1643—Torricelli, Italian physicist, hastened the development of modern hydraulic pumps when he found water could be raised in a tube by air pressure.



2 1840—Steam pump engines were helping to keep water out of mines. But low-cost electricity which put the *big* push behind pumping was still to come.

3 1915—Howell "Red Band" Electric Motors were introduced. Soon, these rugged, industrial-type motors gained wide recognition in this and other industries.

PUMPS . . . IRON HEARTS OF INDUSTRY!



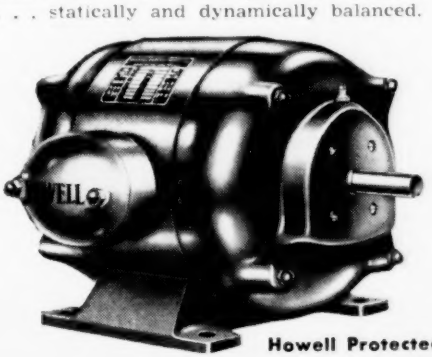
4 Today — Electrically driven pumps form the iron hearts of industry and vital public utilities. Pumps keep water, oil, gasoline and many other essential fluids and gases flowing.

On pumping jobs of all kinds, you'll find precision-built Howell Industrial-type Motors giving dependable performance year after year.

Howell Motors are also an important source of power for fans, conveyors, machine tools and other industrial equipment.

Are *you* using Howell Motors?

Here's another precision-built Howell Motor . . . industrial type with copper or bronze bar rotors . . . specially insulated . . . statically and dynamically balanced.

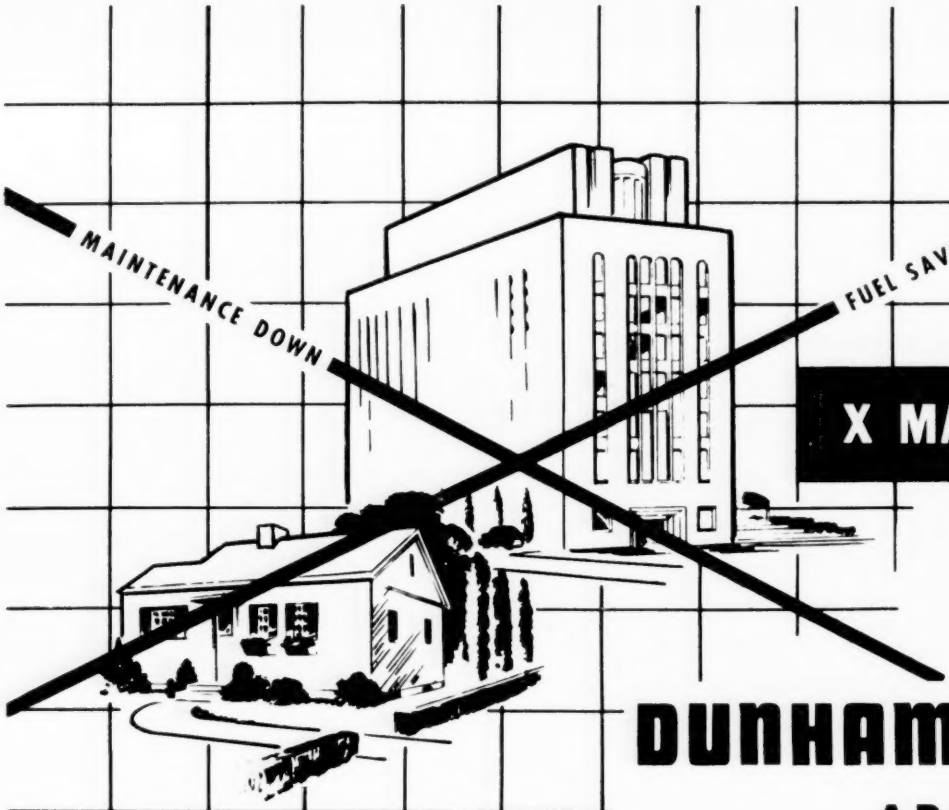


Howell Protected Type Motors

HOWELL MOTORS

HOWELL ELECTRIC MOTORS CO., HOWELL, MICH.

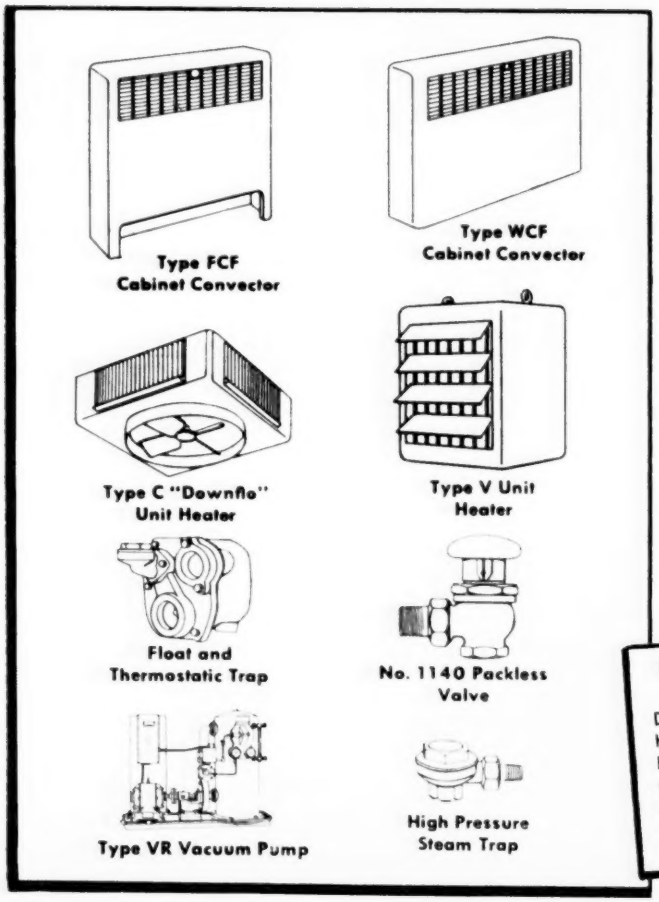
Manufacturers of Quality Industrial Type Motors Since 1915



X MARKS THE SPOT

WHERE DUNHAM PRODUCTS ARE INSTALLED

"SYSTEMS ENGINEERING" BY DUNHAM POINTS THE WAY TO GREATER PRODUCT EFFICIENCY


Type FCF Cabinet Convector
Type WCF Cabinet Convector
Type C "Downflo" Unit Heater
Type V Unit Heater
Float and Thermostatic Trap
No. 1140 Packless Valve
Type VR Vacuum Pump
High Pressure Steam Trap

Proven in installations from Rockefeller Center to Main Street and in many of the world's largest housing projects to single-family dwellings. Dunham products are engineered to afford greater heating efficiency at lowest possible fuel costs. Because they are "system-engineered" you are assured that they have been manufactured for simplicity in installation.

When you specify Dunham products or Dunham Systems for your installations you can be sure that you get equipment that will afford the best in heating results. C. A. DUNHAM CO., 400 W. Madison St., Chicago 6, Illinois.

FOR YOUR GREATER CONVENIENCE

Dunham Traps, Valves, Unit Heaters, Convectors, Baseboard, are available through your jobber—see him or write: C. A. DUNHAM COMPANY, 400 W. Madison St., Chicago 6, Illinois

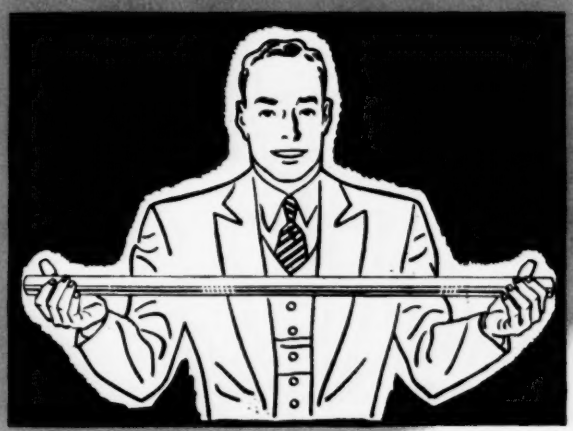
DUNHAM

HEATING MEANS BETTER HEATING

A FOOT

becomes

A YARD



when you use

ALCOA ALUMINUM TUBING

Size for size, you get three times as many feet in a pound of Alcoa Aluminum Tubing as you do in copper. Aluminum's lighter weight is, of course, the reason.

So, when you figure tubing prices in *feet* instead of in pounds, savings run as high as 40 per cent when you use Alcoa Aluminum. That can mean thousands of dollars a year to even a medium sized user of tubing.

Low price isn't the only advantage. Alcoa Aluminum Tubing has good resistance to corrosion. It is safe to use with practically all commercial refrigerants. Although strong to resist vibration, it is easy to bend into coils.

If you are not already using aluminum, take a look at your tubing costs. See what you're paying and how much you can save by going to Alcoa Aluminum Tubing. Our nearest sales office can answer any questions about it. Or write ALUMINUM COMPANY OF AMERICA, 1471 Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA FIRST IN ALUMINUM

ALCOA ALUMINUM 1888 1948 60 YEARS OF SERVICE

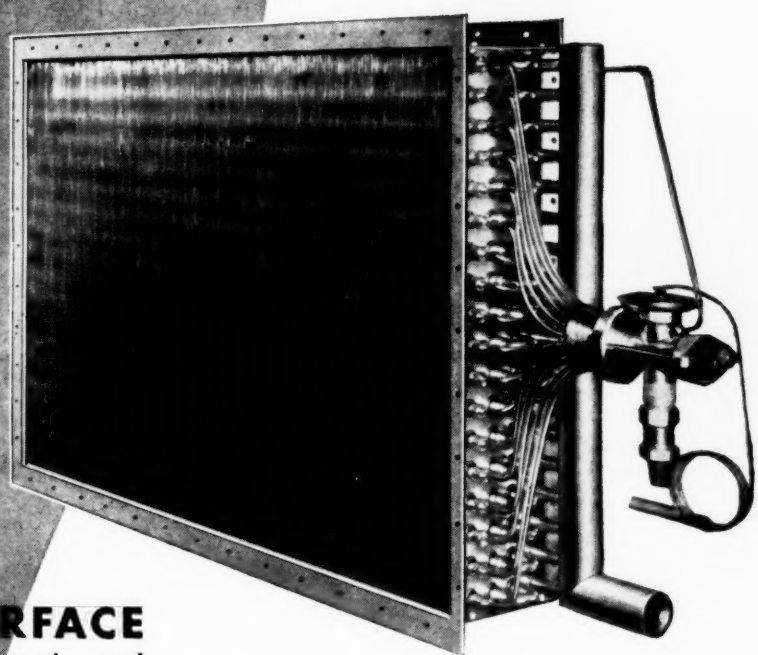
We can't *make* ***all*** *the*

Heat Transfer Surface

So we make the ***Best*** *of it* !

ONLY KENNARD *Engineered* COILS

Give You so Much...



CLEANER INSIDE SURFACE

Hydraulic stretching loosens scale and oxides subsequently blown OUT of coil reduces danger of scoring compressor.

SAFER COIL—Having withstood 3000 psi for bonding is safe-guarded against leaks.

UNIFORM EVEN STRESS—in ALL fins—good mechanical and thermal bond.

NO-RUST FRAMES

Frames up to 72" are ALUMINUM. Larger sizes framed in steel, hot-dipped galvanized AFTER FABRICATION.

ONE-PIECE FINS *(All Lengths)*

Solid plate type fin for ALL coils. Reduces air resistance. Requires less fan power. Minimizes fuzz and lint fouling.

Your inquries invited. Send for Kennard Catalog 47-A (Finned Coils). Other Kennard catalogs: No. 4710 Unit Heaters (Horizontal) No. 481—Air Conditioning and Blower Units.

KENNARD CORPORATION

1823 S. HANLEY RD., ST. LOUIS 17, MO.

BRUNNER
SINCE 1906

REFRIGERATION helps you serve better

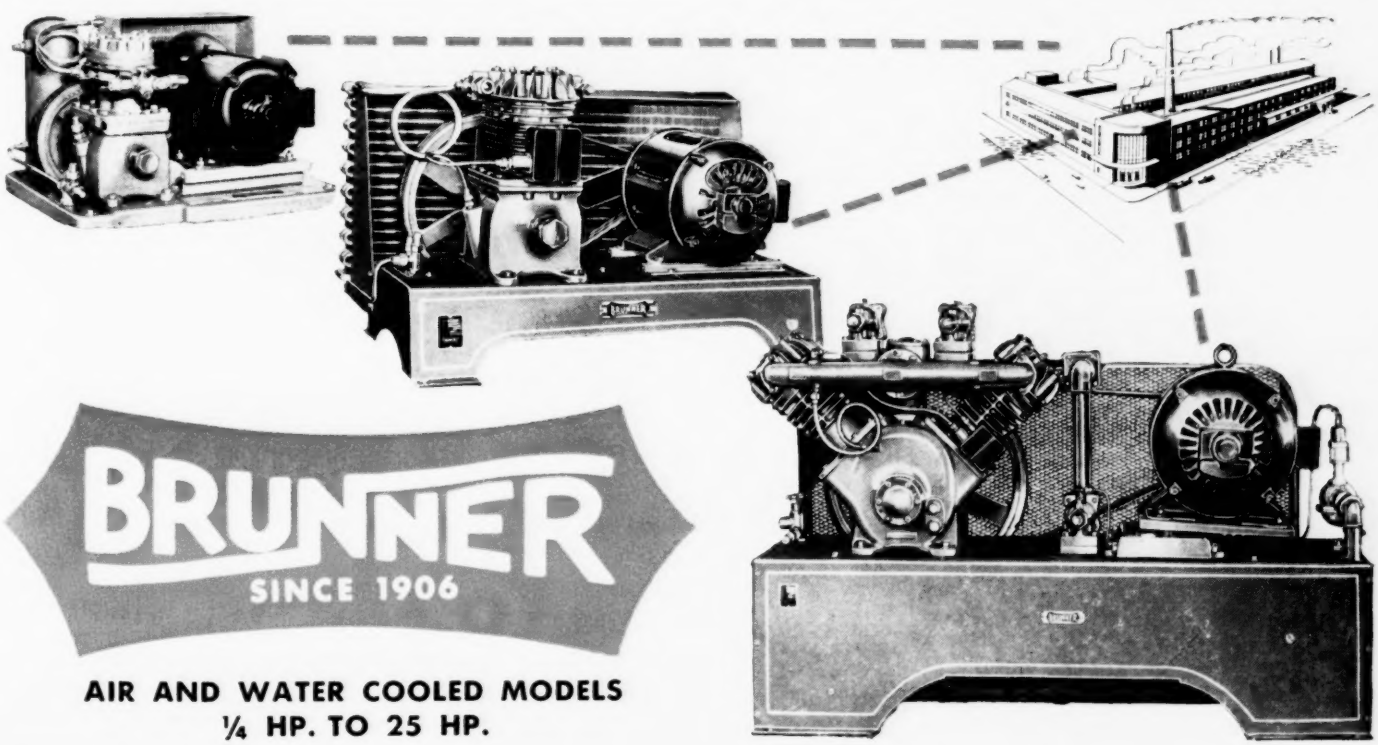
Memo to Contractors

CONDENSING UNITS ARE MOST INTERESTING

Guess we say condensing units are *most* interesting because they look so much alike but are so very different in service...there are so many angles to be considered and checked.

The important point is just this: the entire success of an air conditioning or other refrigeration installation stems from the condensing unit. That unit must be selected on the basis of in-service facts on dependability, long life, minimum maintenance. Your business depends upon your judgment in selection. Brunner condensing units throughout the world; Brunner representatives who live near you and talk your language; expanded plant facilities for quick delivery; are the *sure* answers to all your questions. Write us about the job you have in mind.

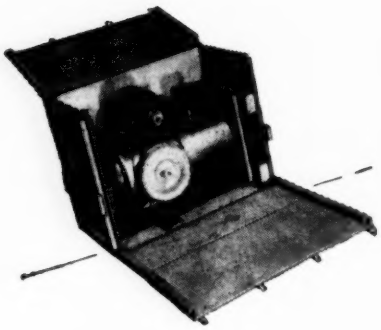
BRUNNER MANUFACTURING CO.
UTICA 1, NEW YORK, U. S. A.

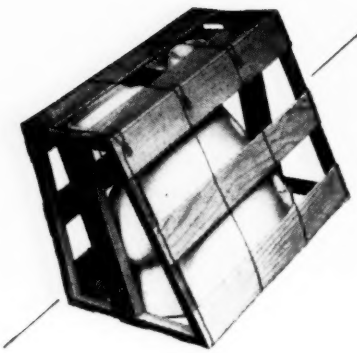


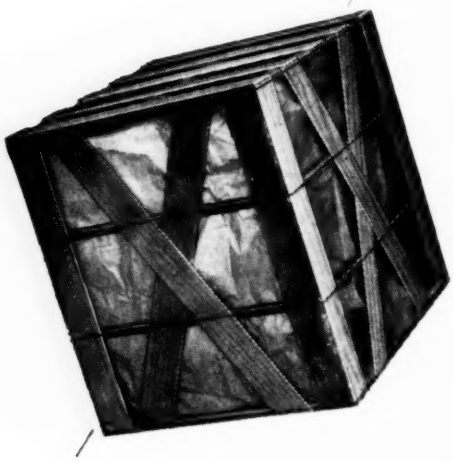
BRUNNER
SINCE 1906

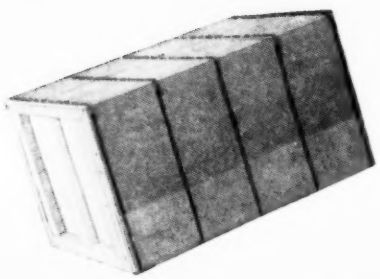
AIR AND WATER COOLED MODELS
¼ HP. TO 25 HP.

for safe arrivals





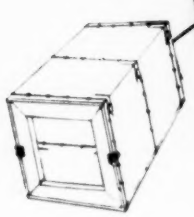




WIREBOUNDS AFFORD GREATER PROTECTION

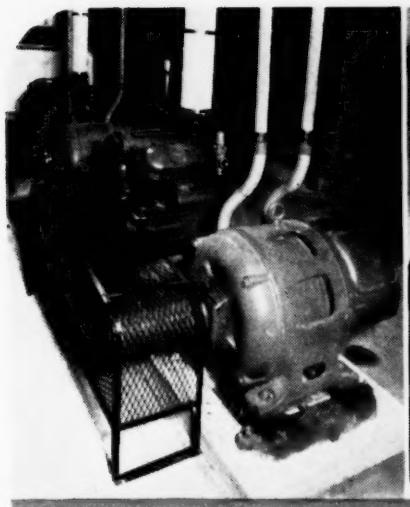
The light weight, resilient construction of **Wirebound** Boxes and Crates offers safer, lower cost shipping that benefits the dealer, wholesaler and manufacturer alike. **Wirebounds** combine the strength of steel with thinner wood . . . a time-tested combination that withstands the shocks of rough handling in all phases of warehousing and shipping. This means lower shipping charges, reduced damage, and fewer losses of time and money on returned goods. Every **Wirebound** is specifically designed to meet the requirements of each product carried . . . whether it is heavy hardware, component parts, a product with enameled surfaces or constructed of thin sheet metal sections. **Wirebounds** are easier to handle, easier to unpack and can often be reused.

Yes, if it's shipped Wirebound you can be sure it's shipped right!

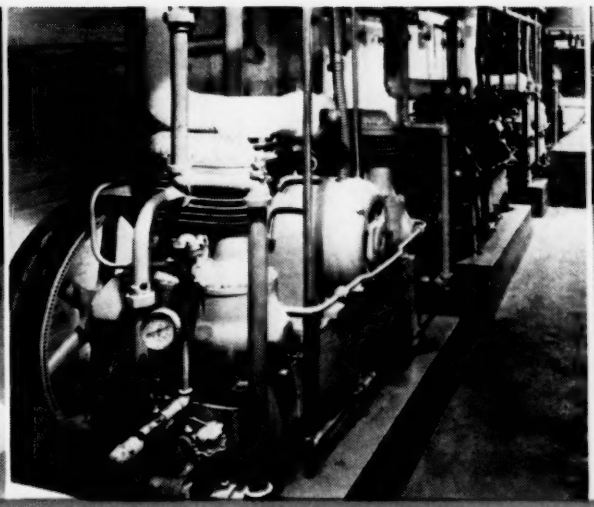


Wirebound
BOXES & CRATES

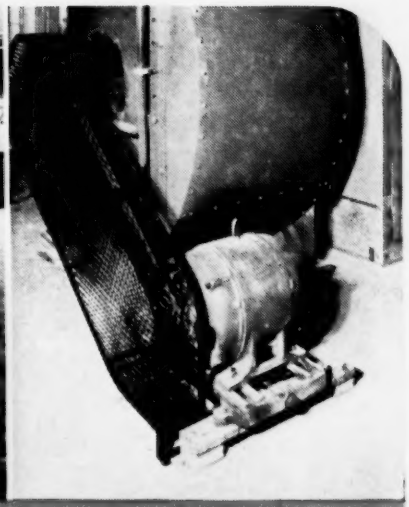
WIREBOUND BOX MANUFACTURERS ASSOCIATION
ROOM 1831 BORLAND BUILDING, CHICAGO 3, ILLINOIS



Two 60 horsepower Century Slip Ring motors driving refrigeration compressors



Three 25 horsepower Century SCH motors driving compressors



Century 10 horsepower SC motor drives a large blower

Engineered for Air Conditioning Comfort . . .

Century Motors Provide

Unusually Quiet { Starting Characteristics / Running Characteristics

Both quiet starting and quiet running are essential to human comfort.

Century electrical design reduces magnetic noise to a low level and Century mechanical design provides unusual freedom from vibration.

Century builds electric motors in a wide range of types and sizes to meet the requirements of all popular air conditioning applications.

Century Form J Squirrel Cage Motor

Three Phase —

SC — 1/6 to 400 horsepower — squirrel cage, normal starting torque, normal starting current

SCH — 5 to 150 horsepower — squirrel cage, high starting torque, low starting current

SC Multispeed — 1/3 to 125 horsepower — squirrel cage, constant torque, variable torque or constant horsepower

SR — 1 to 350 horsepower — slip ring, high starting torque, low starting current, adjustable varying speed

Single Phase —

RS — 1/2 to 20 horsepower — repulsion start induction brush lifting motor, high starting torque, low starting current

CSH — 1/6 to 20 horsepower — capacitor start induction, high starting torque, normal starting current

Direct Current —

DC — 1/6 to 300 horsepower — for all direct current requirements.

Specify Century motors for all your electric power requirements

576

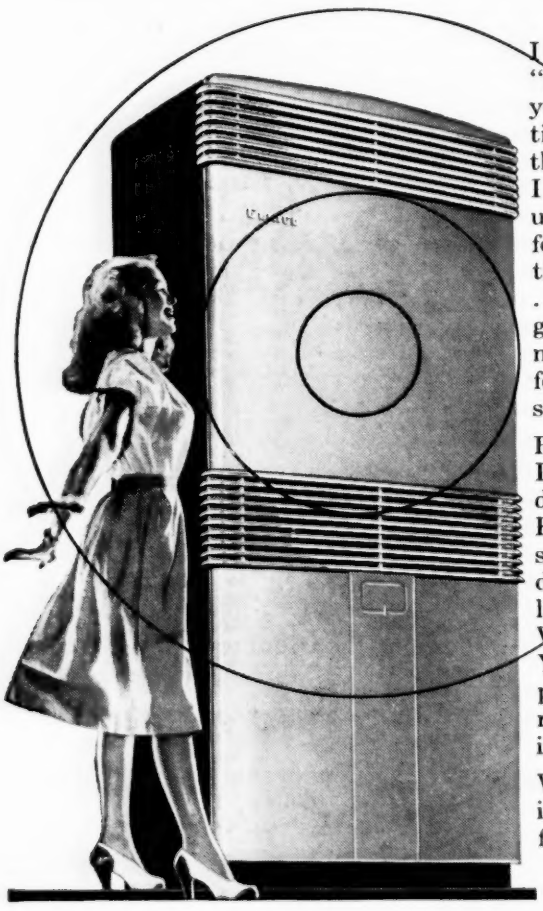
Century C MOTORS

CENTURY ELECTRIC COMPANY • 1806 Pine St., St. Louis 3, Mo.

Offices and Stock Points in Principal Cities

In these leading business magazines

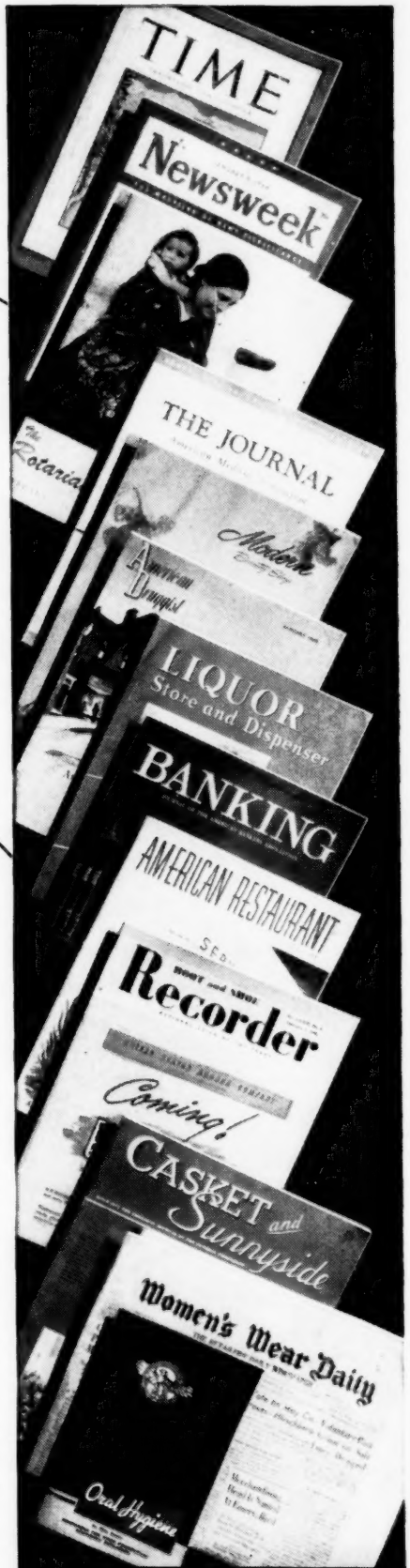
7½ MILLION OF THE BEST "PROSPECTS" FOR AIR CONDITIONING in America are Reading why GEMCO'S THE BUY



If you're selling Gemco "packaged" Air Conditioners, you've felt the effect of national advertising directed to the *people who sign the orders.* It's a direct story of the unique, years-ahead Gemco features that make air conditioning practical to *buy now* . . . Your best prospects are getting this message, in the magazines shown at right. A few desirable territories are still open.

Remember, too—Gemco Dealers automatically become dealers for MIRACULA, the Heat Pump that caused a sensation at the recent Air Conditioning Exposition in Cleveland and the Heating and Ventilating Exposition in New York. Dealers are now making pilot installations, so as to be ready for the volume market in 1949.

Wire or write for complete information on the Gemco franchise *now.*



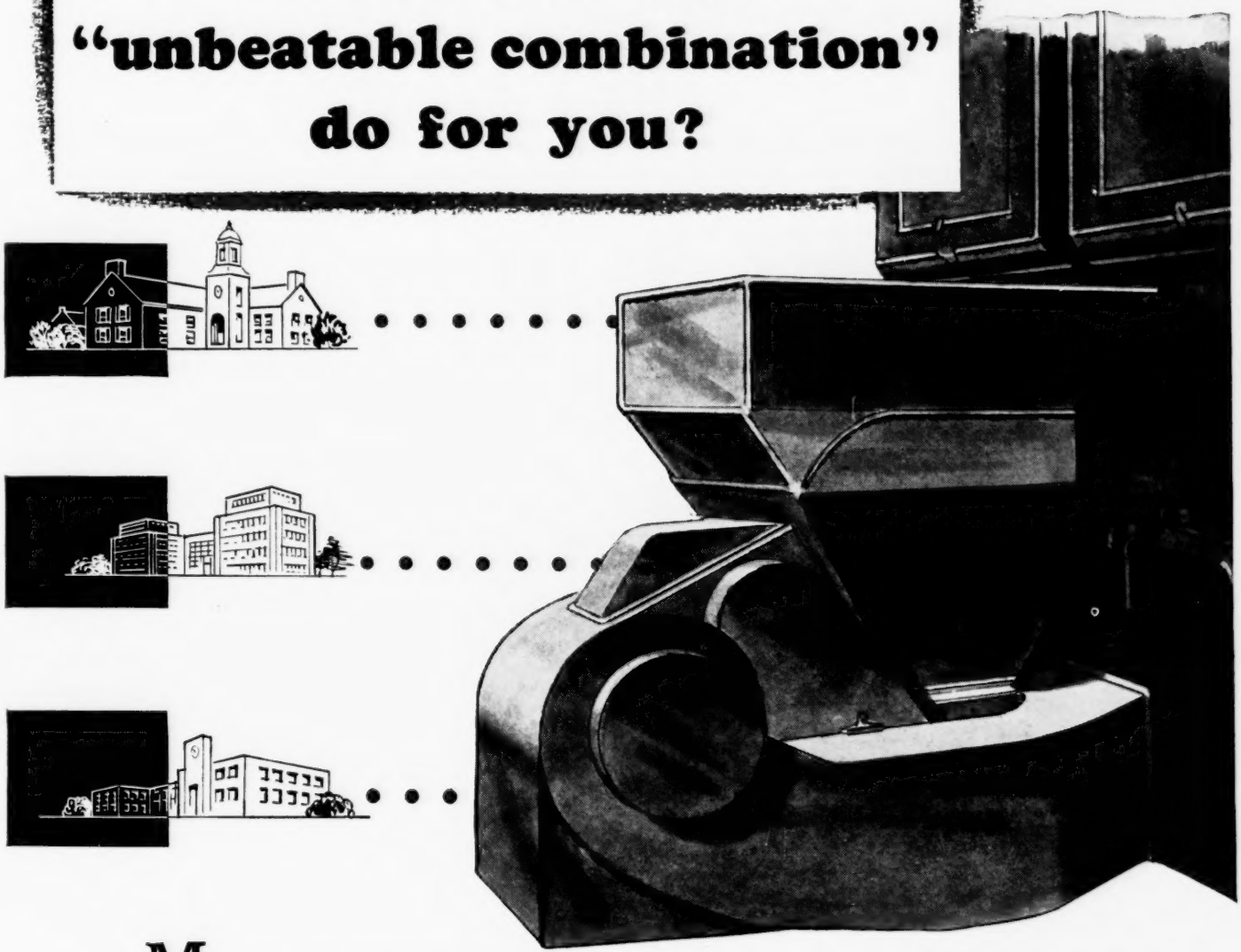
Gemco

AIR CONDITIONING

GENERAL ENGINEERING & MANUFACTURING CO.

4417 Oleatha Ave. · St. Louis 16, Mo.

What can the "unbeatable combination" do for you?



Modern hard coal stokers and plentiful anthracite are an unbeatable heating combination. They can help protect your investments and keep tenants satisfied because automatic hard coal heat gives you:

Economical Heat. Stokers use the smaller, economical stoker sizes of hard coal. Thousands of satisfied owners of anthracite stokers testify to reduced fuel bills . . . *as much as 50% lower!*

Completely Automatic Heat. Modern hard coal stokers are fully automatic . . . from bin feed to ash removal. Sensitive thermostatic controls respond to the slightest change in temperature. They work immediately sending steady heat through the building.

Plenty of Heat. A full year's supply of plentiful, stoker size anthracite can be stored without danger. Every day regardless of the temperature outside, the building is healthfully, comfortably warm. Tenants are satisfied . . . investments protected.

Get all the facts on heating with all types of anthracite equipment including modern automatic stokers. Simply fill out the coupon and send it to us, today.

ANTHRACITE INSTITUTE

101 Park Avenue • New York 17, New York

ANTHRACITE INSTITUTE
101 Park Avenue, Dept. 5I
New York 17, New York

Please send me more information on anthracite and anthracite heating.

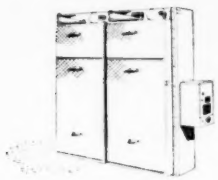
Name_____

Company_____

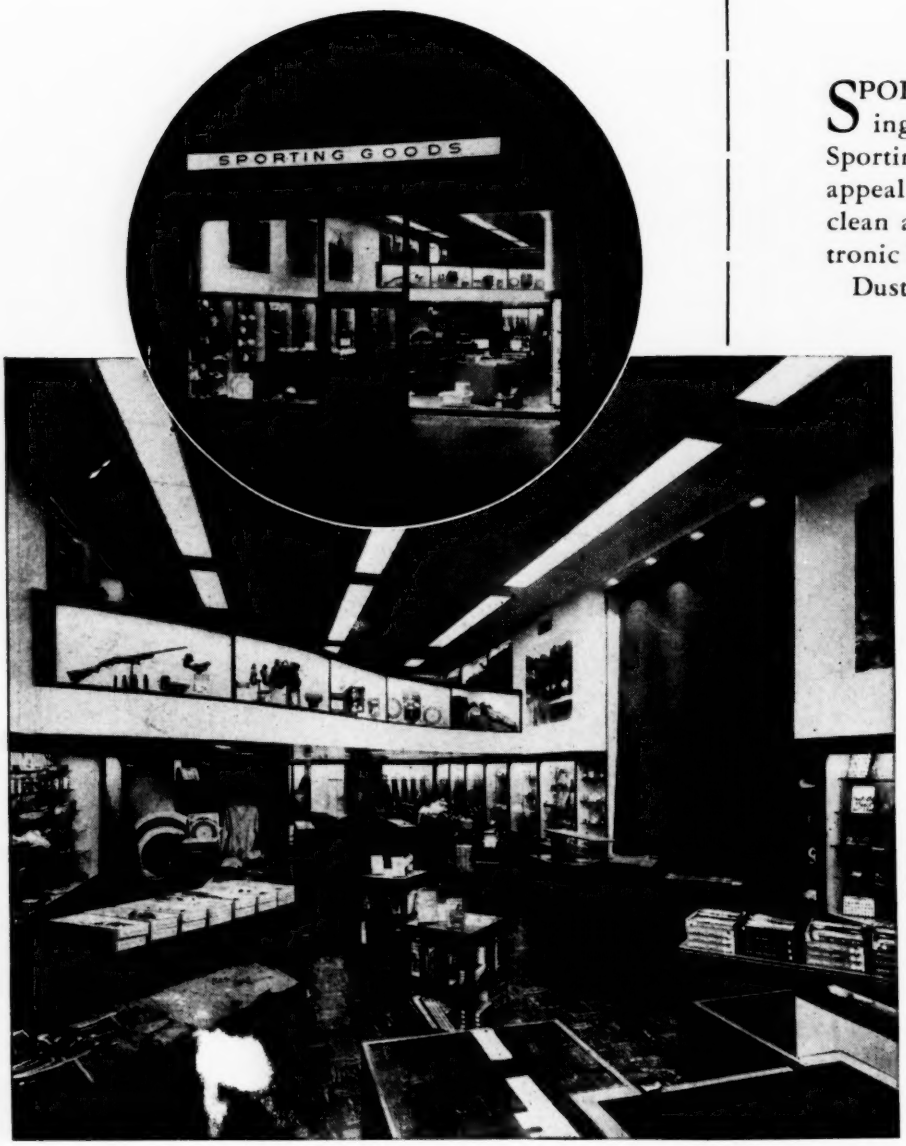
Address_____

City_____ Zone____ State_____

SUPER-CLEAN AIR



adds to sales appeal and savings



SPORTS lovers will have a hard time "passing up" this modern store of American Sporting Goods, St. Louis, Mo. It has sales appeal built right into it—even down to super-clean air supplied by AAF Electro-Cell Electronic Precipitators.

Dust and smoke can't find their way to the merchandise here. Firearms, fishing reels and other sports gear will keep that "fresh from the factory" look. Fixtures, walls and decorations will retain their new appearance with a minimum of maintenance. In brief—super-clean air contributes much to continuous sales appeal and savings.

Whether it's a smart shop on Main Street or a manufacturer in the heart of the industrial district, each has a need for filtered air to protect a product or improve a service. And, regardless of their needs, there's an AAF Filter of a type and capacity to meet their requirements.

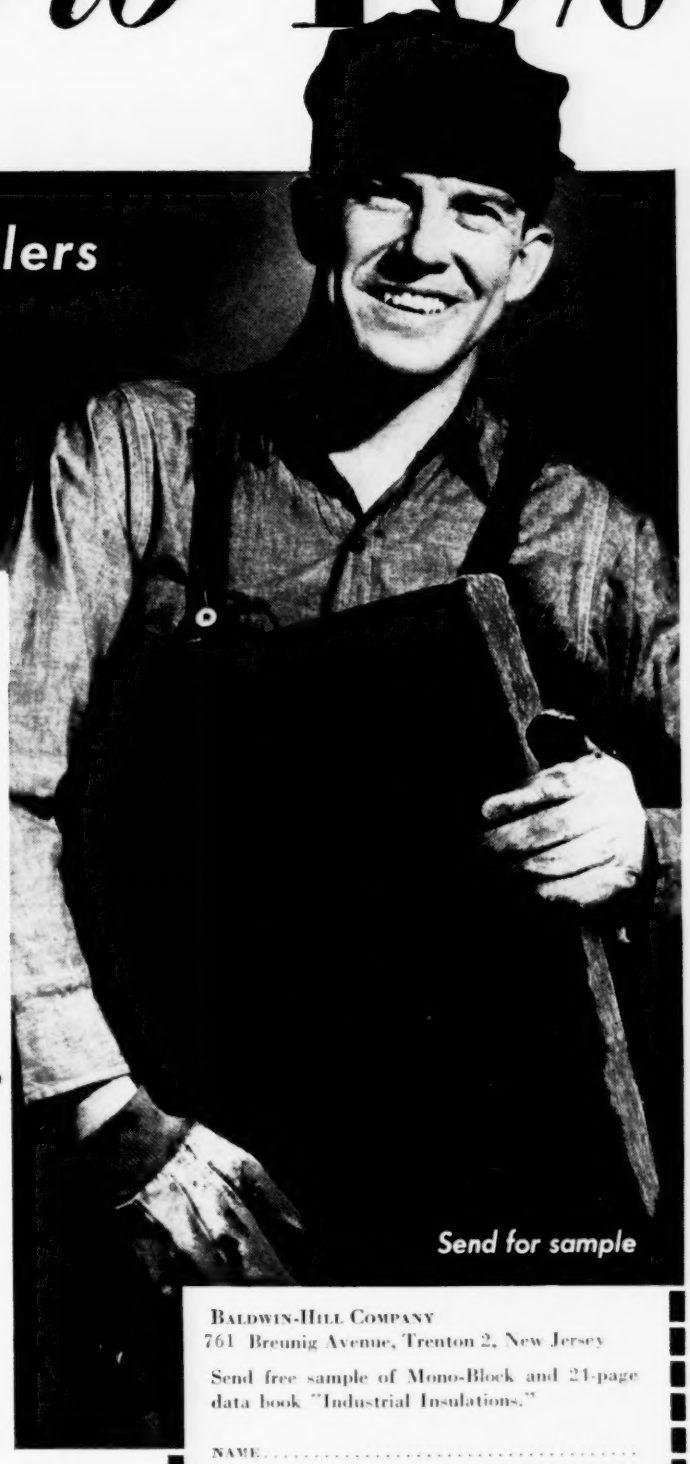
If you pride yourself on quality of work and customer satisfaction, you will want to recommend and specify AAF Electronic Precipitators. It's a complete line made by the world's largest exclusive manufacturer of air filters. Complete catalog data can be obtained from your local AAF representative or by writing direct to—

AMERICAN AIR FILTER COMPANY, INC.
294 Central Avenue, Louisville 8, Ky.
In Canada: Darling Bros., Ltd., Montreal, P. Q.

®AAF

AIR FILTERS
AND DUST CONTROL EQUIPMENT

SAVE *up to* 40%



If you make or use boilers insulate with

MONO-BLOCK!

Records show it! Today's buyers know it! In insulating boilers and processing equipment, you can save up to 40%—using this one-block insulation that serves the full temperature range.

Savings in Material — Because Mono-Block is effective up to 1700°F, you eliminate the need for two types of block—save up to 40% in material alone.

Savings in Labor—Only one block to apply instead of handling a combination of blocks. B-H Mono-Block is light and resilient, cuts readily and fits snugly over rivet heads and other irregular surfaces.

Savings in Heat — B-H Mono-Block stops heat loss *with maximum efficiency*—because it's felted of long fibre *black* Rockwool. For example, conductivity of one inch thickness at 1000°F is only 0.64 btu's per square foot per hour. Low alkalinity insures stability even under severe conditions.

Isn't that worth investigating? As a first step, send the coupon for a sample and descriptive literature.

Send for sample

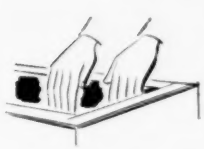
Baldwin-Hill

Specialists in Thermal Insulation

BH NO. 1 CEMENT

BH BLANKETS

BH WEATHERSEAL



BH FELTS

BALDWIN-HILL COMPANY
761 Breunig Avenue, Trenton 2, New Jersey

Send free sample of Mono-Block and 24-page data book "Industrial Insulations."

NAME .....

POSITION .....

FIRM .....

ADDRESS .....

.....

For low operating costs, high heating efficiency

THIS ENGINEER RECOMMENDS OIL HEATING —PETRO preferred!

Henry C. Meyer, 3rd, is a member of Meyer, Strong & Jones, Inc., prominent New York firm of Consulting Mechanical and Electrical Engineers. Among the buildings in which this company has used Petro Oil Burning Systems are the New York Telephone Company Building in Brooklyn, and the American Insurance Building and the Newark and Essex National Bank Building, both in Newark, New Jersey.

RUNNING big buildings is big business. With operating costs up, engineers, architects and management men today are depending on oil heat to hold heating costs down.

"In our experience," says Mr. Meyer, "American industries owe a great debt to oil heating systems, for they have produced low operating costs plus high heating efficiency, combined with cleanliness, flexibility and quick steaming."

Of course, Petro Oil Burning Systems provide *all* these advantages. Designed to utilize every drop of fuel oil economically . . . soundly engineered for reliable performance . . . Petro Systems are preferred by concerns like Mr. Meyer's to whom years of uninterrupted oil burner service is a "must".

To satisfy your client with oil heat at its best, choose Petro. Your selection is reinforced by the reputation, financial stability and engineering leadership of the world's oldest and largest exclusive maker of oil burning equipment—Petro.

INDUSTRIAL MODELS: No. 5 or No. 6 fuel oil; manual, semi-automatic or automatic operation; 8 sizes to 450 bhp. Thermal Viscosity preheating.

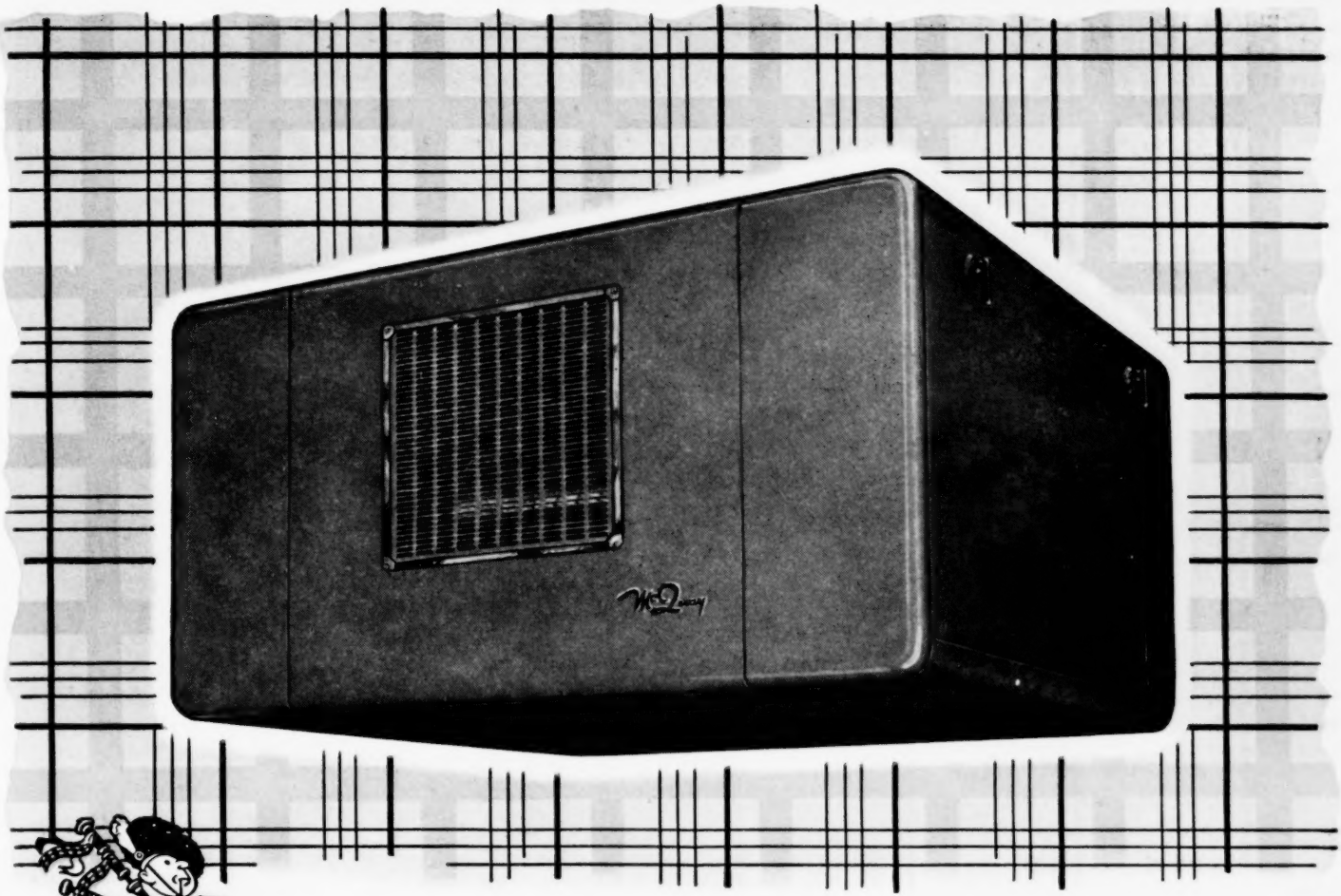
DOMESTIC MODELS: No. 3 or lighter oils; conversion and combination-unit types, 7 sizes. Patented "Tubular Atomization."

FULL DATA on Petro Industrial Burners are in catalog files of Sweet's and Domestic Engineering. Details on Petro Domestic Burners available in separate catalog. Copy of either sent gladly on request.

PETRO
REG. U.S. PAT. OFF.

cuts steam costs

PETROLEUM HEAT AND POWER CO. • Makers of Good Oil Burning Equipment Since 1903 • Stamford, Connecticut



HERE'S AIR CONDITIONING LUXURY

ECONOMY SIZE!

Air conditioning is now on a "can afford" level for those smaller spaces where, actually, it is needed most. McQuay RH series units have been engineered to deliver thrifty year round air conditioning on a low initial investment. Designed for ceiling or regular fixture mounting, these units leave valuable floor space free. They are an ideal answer to the air conditioning needs of individual offices, specialty shops, club rooms, restaurants and similar low capacity areas. Where space and cost are factors, get information on McQuay RH series units from the representative in your area or from McQuay, Inc., 1619 Broadway N.E., Minneapolis.

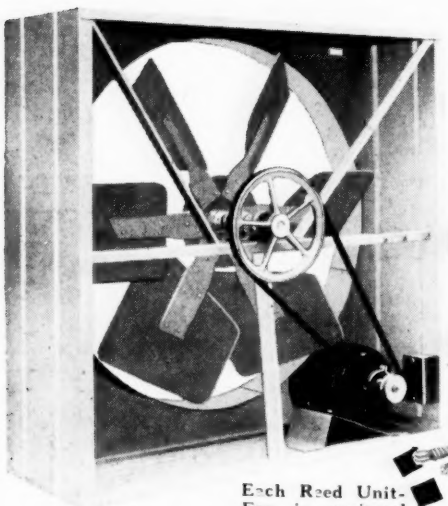
McQuay INC.

HEATING • AIR CONDITIONING • REFRIGERATION

SIMPLIFY YOUR SALES . . . MULTIPLY YOUR PROFITS!

Reed Unit-Fans offer you the opportunity for "comfortable" profits on increased sales, with "comfortably" low inventory costs. With the addition of simple attachments to the basic Reed Unit-Fan — you can display window fans, attic fans, portable floor fans or commercial exhaust jobs. A dealer has only to stock basic fan models in different sizes to serve this wide variety of uses.

THE SAME REED UNIT-FAN IS USED



Each Reed Unit-Fan is equipped with a heavy duty reversing switch with middle off position, and a 10-foot cord and plug. Fan case is finished with two coats of light ivory, baked synthetic enamel. Blades are sheet aluminum.

In its role as a window fan, the Reed Unit-Fan is attractive in appearance and provides cool comfort throughout the home.

"Comfort Cooling" in the office or any room in the house is easy with the Reed Portable Floor Fan.

Quickly and easily installed in the attic, the Reed Unit-Fan removes hot air and fills every room in the house with cool, moving air.

Only Reed "Comfort Cooling" Units, offer you these features. Dealerships are now available. . . . Write today for catalog, prices, etc.

R-U-F TRADE MARK

REED UNIT-FANS, INC.

Manufacturers of Ventilating Equipment

1001 St. Charles Ave., New Orleans 8, La., U.S.A.

Certified Ratings PFMA

How to give Mr. and Mrs. Public

A Warm Welcome!

1. MODERN LOOK of Modine's new Unit Heaters matches interior of this newly remodeled supermarket. Overhead, out of the way, they always keep store at right shopping temperatures.

2. CUSTOMER COMFORT is important to this camera dealer. That's why you see a Modine Vertical Unit Heater mounted directly over the door to keep entrance free from chilling drafts.

3. NO FUEL WASTE! Thanks to a Modine Horizontal Unit Heater, this automobile dealer has a comfortable showroom. There's no fuel wasted regardless of room area or outside temperature.

4. SAVES SPACE! In high rental areas where display counters and racks need all possible room, Modine Unit Heaters handle the heating problem from above with style, beauty, comfort.

Specify Unit Heating...and specify Modine

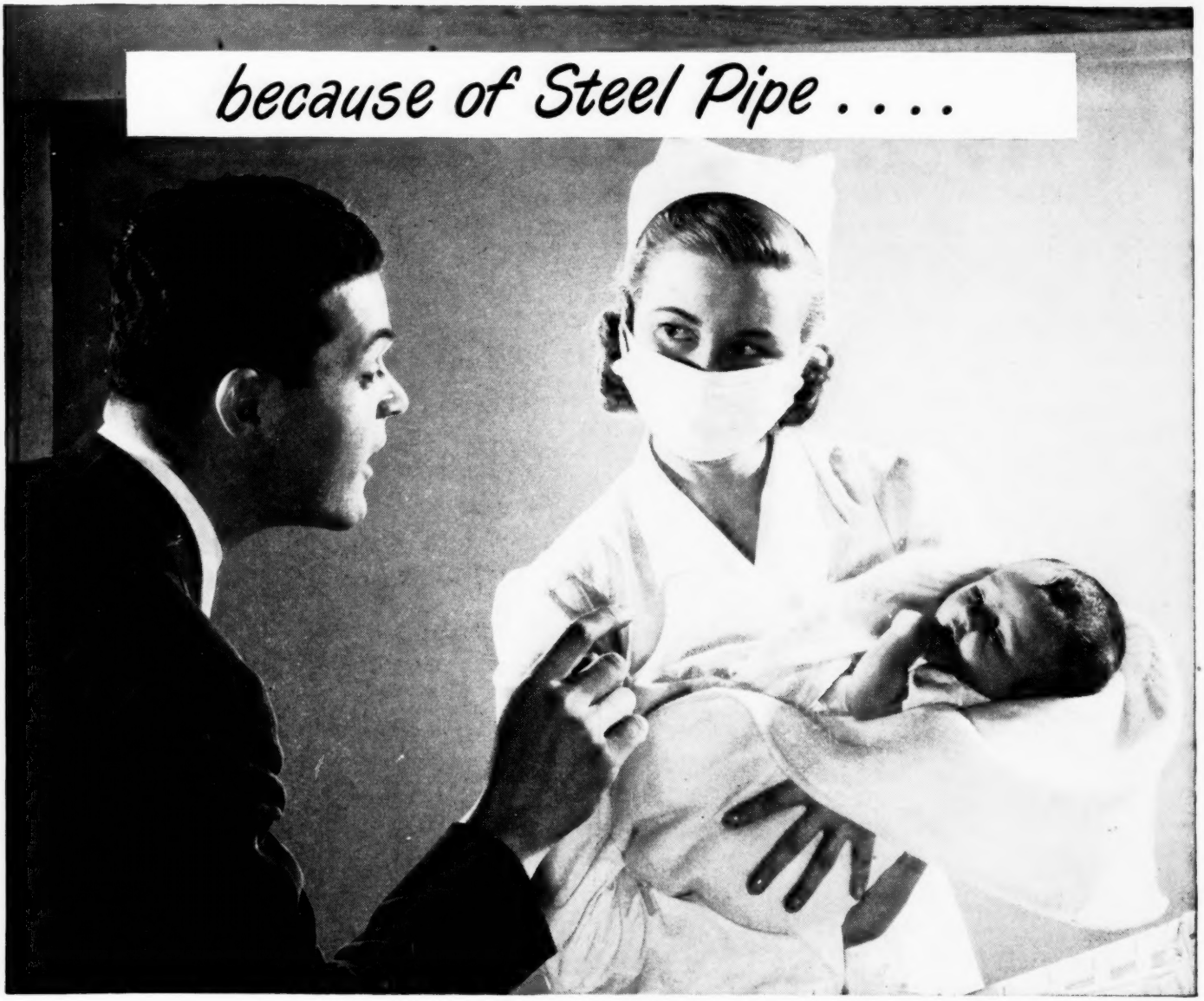
EASY ON THE EYES—that's what you'll say about these new Modines — functionally designed and streamlined to add beauty to any store interior. Easy on the ears, too, because Modines are sound-silenced for hush-hush service. And like light, you can beam, flood, or gently diffuse heated air where and when you want it. Simple to install — either exposed, recessed or concealed. Call Modine's representative, listed in the "Where-to-Buy-it" section of your phone book, or send in coupon at right.

MODINE MANUFACTURING CO.
1511 Dekoven Ave.
Racine, Wisconsin

Yes! I want all the facts about Modine's integrated Unit Heater Line. Please send me complete information.

NAME .....
ADDRESS .....
CITY ..... STATE .....

Modine UNIT HEATERS



father and baby are "doing fine"

Mother, too . . . safe and smiling just down the hall, secure in the knowledge that modern aseptic practices have virtually banished the old causes for a father's fear at "blessed event" time. And baby, in his germ-free kingdom of cribs, will live to learn that any boy may grow up to be president!

Asepsis (freedom from harmful organisms) is best achieved, says a nationally known physician, by the "frequent and copious application of hot water, soap, and elbow grease."

Yes, good health and good water go hand in hand. Every hospital, every doctor's office, every home can be practically infection-free when pure water is generously utilized to promote cleanliness.

Steel pipe makes it possible!

For steel pipe is economical, adaptable, serviceable and durable . . . qualities which make practical its unrestricted use in the transmission of water, gas, oil, steam and other fluids wherever or whenever they contribute to the health, safety, comfort or convenience of mankind.

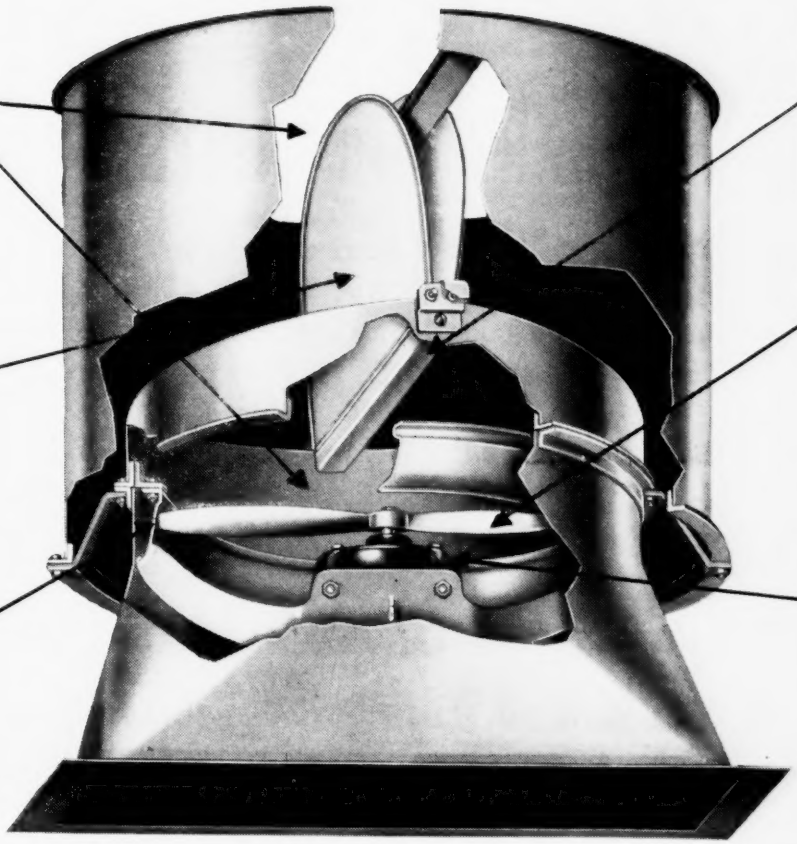
The interesting story of "Pipe in American Life" will be sent upon request.

COMMITTEE ON STEEL PIPE RESEARCH of American Iron and Steel Institute, 350 Fifth Avenue, New York 1, N.Y.

STEEL PIPE MAKES IT POSSIBLE!

. . . better living through pipes of steel for plumbing and heating purposes.

See how Simple and Effective Good Roof Ventilation can be!



INSIDE IS WIDE OPEN

Guide vane effect provides virtually zero resistance to high-volume air passage.

AUTOMATIC DAMPERS

Open the instant fan starts; close as fan coasts to stop.

NO "TIP RECIRCULATION"

Airfoil-principle entrance ring leaves no "dead" areas, prevents backflow.

CAN'T LEAK

Drainage gutter prevents leakage when fan is "off."

HIGH EFFICIENCY

Propellair cast-aluminum airfoil blades work full length, develop uniform velocity.

PROTECTED MOTOR

Robbins & Myers fully-enclosed, sealed-ball-bearing Uni-Shell motors are standard.

The VERTI-STACK POWER ROOF VENTILATOR

In roof ventilation, it's air movement that matters — and the more air movement, the better. That's why simple Verti-Stacks, pioneered by Propellair in 1932, fill the bill to a "T."

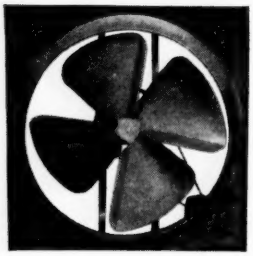
BUILT TO DO A JOB . . . Verti-Stack design is strictly functional. No frills. No gadgets. A powerful suction sweeps up heat, moisture, dust, fumes — and a strong exhaust shoots them high into the outside air. A Propellair Type CD all-steel fan — with cast-aluminum blades, and powered by a Robbins & Myers motor — is the heart of the unit. Verti-Stacks are more than "fans," they're ventilation — engineered for easy mounting on all types of roofs (where they're never in the way), and for dependable operation year after year, with amazingly low maintenance.

THE EASY WAY . . . On new roofs or old, Propellair Verti-Stacks work day or night — winter and summer — to clear the air for action. Sizes: 20" to 60" fan diameter. Capacities to 77,000 c.f.m. Write today for complete information. Ventilating specialists in principal industrial centers.

Verti-Stacks put what's inside, outside. Other Propellairs in mounting types and sizes for all industrial needs.

PROPELLAIR DIVISION OF ROBBINS & MYERS • INC.
SPRINGFIELD • OHIO
"Moving Air is our Business"

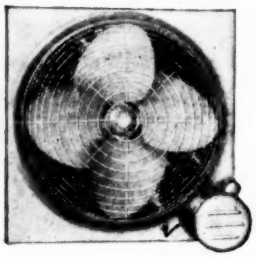
SCHWITZER-CUMMINS FANS and BLOWERS *give you*



1

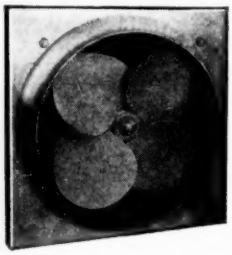
AIR HANDLING AT ITS QUIETEST BEST

You will need the best there is in quality, performance and design in your merchandise for 1948, and all at a reasonable price. With prices what they are, you must have convincing value to offer. Schwitzer-Cummins Fresh-Air Maker fans and Hy-Duty blowers can't be beat for big air delivery, quiet operation, selling features and looks. You will like everything about them and will cheerfully O.K. this year's prices. And there are a surprising number of essential types and sizes to help you get the business and boost your profits.



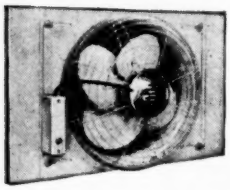
2

- ❶ ATTIC VENTILATORS
- ❷ WINDOW FANS
- ❸ EXHAUST FANS
- ❹ ADJUSTABLE WINDOW FANS
- ❺ PORTABLE CIRCULATING FANS
- ❻ DOUBLE INLET BLOWERS



3

With our enlarged facilities we can now give good service to more dealers and distributors and have some prime territory open. We would like to present a portfolio of new literature descriptive of some very unique and interesting developments for this year's ventilating business. It is yours for the asking.



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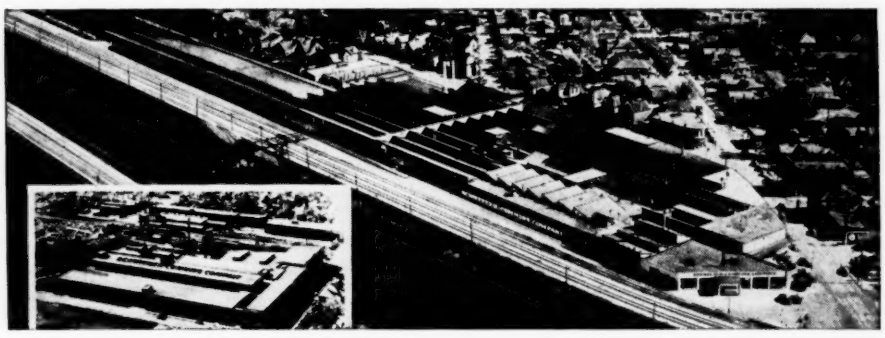

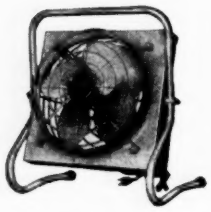

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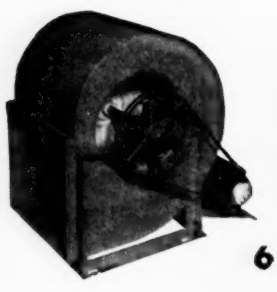
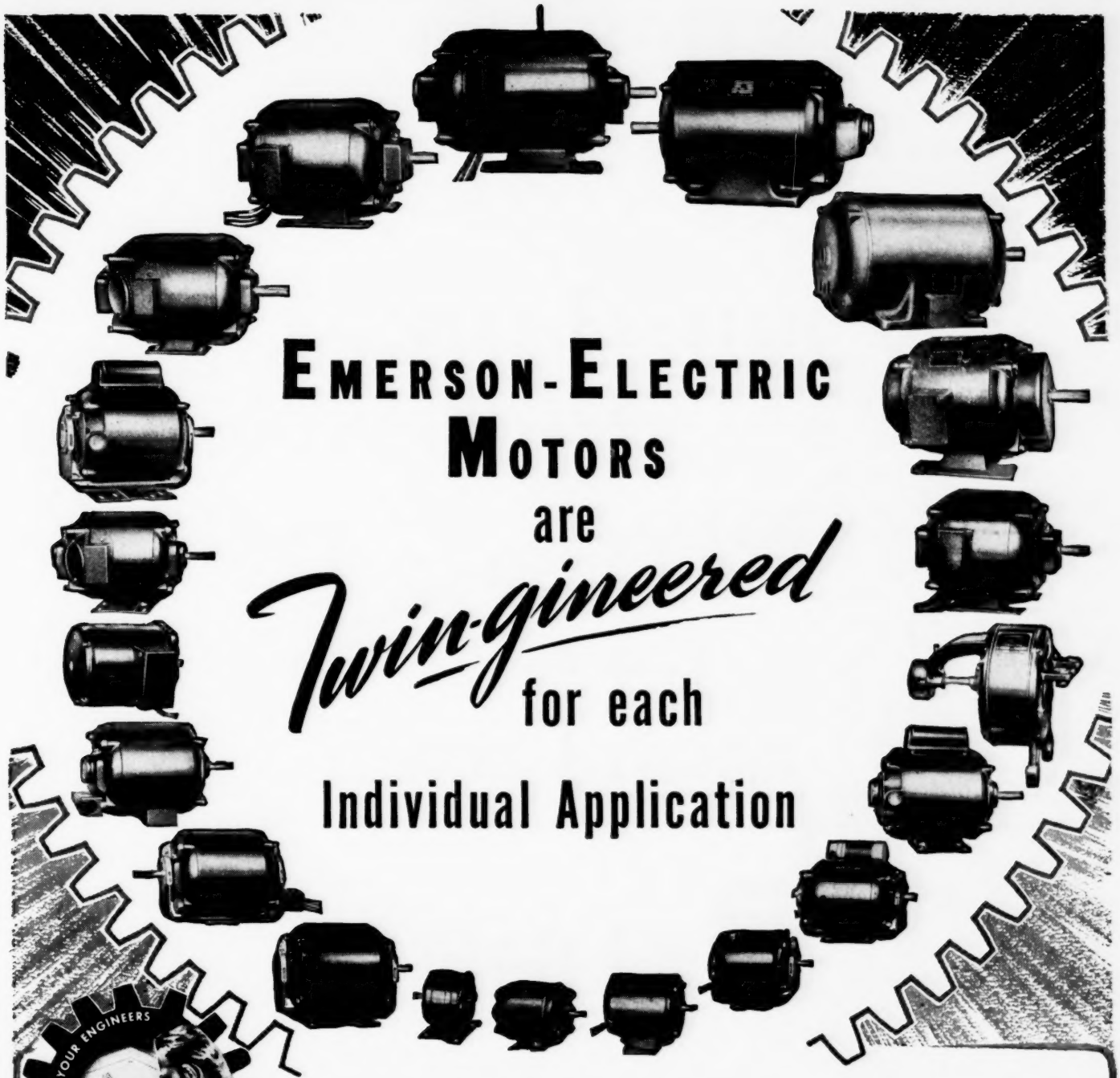
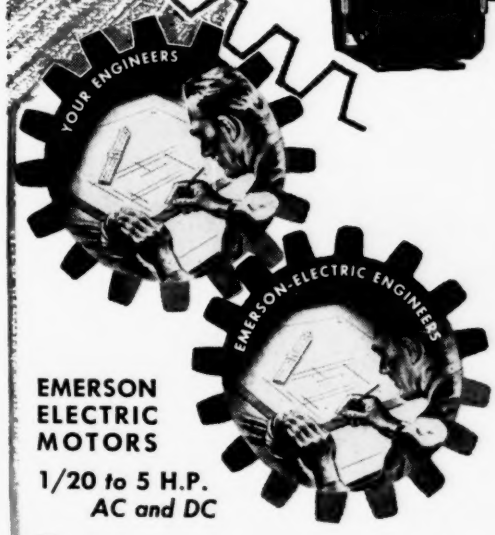


6

SCHWITZER-CUMMINS COMPANY
VENTILATING DIVISION
1145 EAST 22nd STREET • INDIANAPOLIS 7, INDIANA
ENGINEERS AND MANUFACTURERS OF FINE FANS FOR 30 YEARS



EMERSON-ELECTRIC MOTORS are *Twin-gineered* for each Individual Application



EMERSON ELECTRIC MOTORS
1/20 to 5 H.P.
AC and DC

77

Emerson-Electric engineers collaborate with yours in designing and furnishing the right kind of motor to fit your particular appliance or equipment. Such collaboration — Twin-gineering, we call it—may save you considerable engineering back-tracking, suggests money-saving short cuts in manufacturing, helps you equip your new or improved product with the operational advantages which bring greater user-satisfaction and more profitable sales. Learn how this cooperative service can assist you—without charge — write to Emerson-Electric *today!*

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EMERSON EMERSON ELECTRIC **ELECTRIC**

MOTORS · FANS — **APPLIANCES**

A REFERENCE BOOK FOR—
Heating Engineers—Estimators—
Air Conditioning Engineers—Ventilating
Engineers—Architects—Piping Engineers—
Plant Engineers—Contractors—
Operating and Maintenance Engineers—
Engineering Students

HEATING AND VENTILATING'S ENGINEERING

The Scope of the New Engineering Databook

HEATING AND VENTILATING'S new Engineering Databook is an authoritative reference book providing working data on heating, ventilating and air conditioning for design, installation and operating engineers. Its time-saving tables and large-scale charts greatly simplify everyday estimating and design problems. The main subjects in the Databook are grouped under the following eleven divisions, which briefly illustrate the range of this valuable reference work.

1. Heat and Moisture in Air
2. Fuels and Combustion
3. Piping—Sizing, Standards, etc.
4. Air Handling and Ventilation
5. Heating and Heat Transmission
6. Cooling and Air Conditioning
7. Motors—V-Belt Drives
8. What the Contractor Should Know About Contracts
9. Mathematical Tables
10. Drafting Room Standards
11. Terminology of the Industry.

The Engineering Databook is filled with fundamental information, but its overall scope is considerably more than the covering of commonly used data. In addition, the latest information is presented on the important subjects shown in the following list . . . .

Important Data on Recent Developments

The Heat Pump—Use of a refrigerating machine for both heating and cooling a building.

Electrothermal Storage—Drawing the electric energy from the lines during the night and other off-peak hours, and storing the energy as heat in water tanks, to be drawn on as needed.

Snow Melting—Circulation of hot water containing anti-freeze through coils embedded under sidewalks, steps, porches, driveways, etc., for automatic snow removal.

Heating with Diesel Engines—Heating buildings by the use of heat otherwise wasted in the jacket cooling water and the exhaust of Diesel engines.

Attic Ventilation—Pointers on proper design and installation of attic fans for cooling residences.

Heating Water by the Sun—Data and drawings showing how use can be made of solar heat for heating domestic hot water.

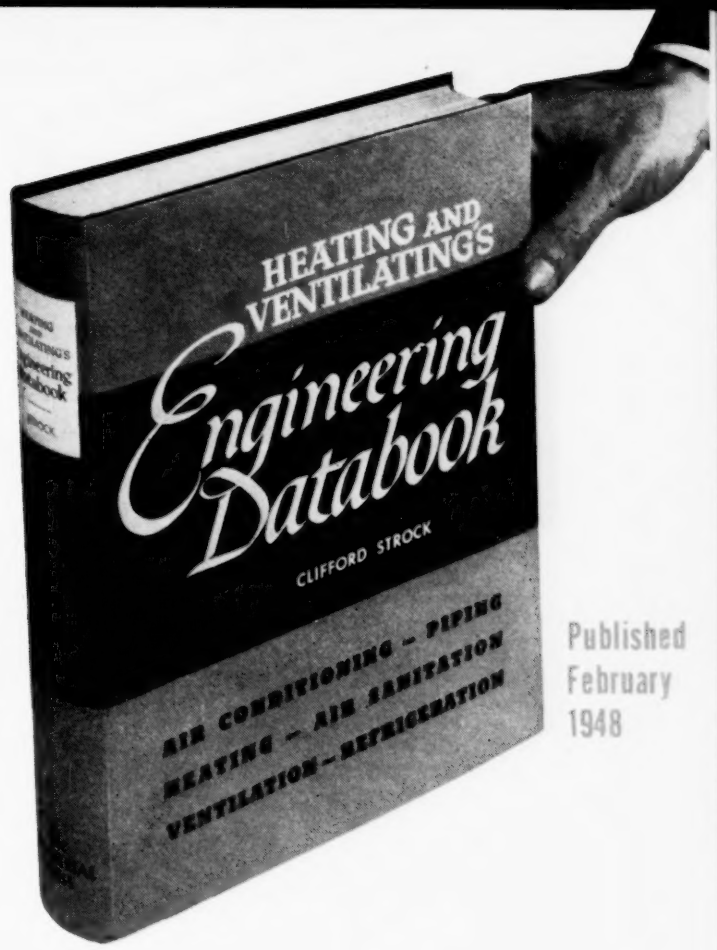
Radiant (Panel) Heating—Data on radiant heating by use of buried electric cables, or buried coils containing hot water, making the heating equipment in the room invisible.

Basementless Buildings—Authentic data on the calculation of heat losses through concrete slabs on the ground and through floors over a crawl space.

Axial Flow Fans—A thoroughgoing discussion on the advantages and disadvantages of axial flow fans as compared with centrifugal fans.

Estimating for Air Conditioning Units—Latest short-cut methods for determining the size of unit air conditioners for cooling offices, stores and residences.

Toxicity—Latest complete and official data on M.A.C. (maximum allowable concentration) of fumes, gases and dust, for determining ventilation quantities.



DATABOOK

Published February 1948

What You Should Know About the Law of Contracts

A most useful and unusual feature of the Engineering Databook is the 18-page section devoted to the law of contracts. This section is based on actual higher court decisions which apply specifically to heating, ventilating and air conditioning cases. In this section are discussed: the validity of contracts, implied warranty, technical competence, alteration of plans, extras, subcontracting, substitutions, inconspicuous clauses, guarantees, distinction between employee and contractor, and many other points covered in the law of contracts. Each case used as an example is one in which a heating, ventilating or air conditioning contractor or engineer was involved. In addition, other legal subjects which concern heating men are discussed, such as: patent infringement, real estate law, relations with municipalities, mechanic's liens, withdrawals of bids, and "cost plus" contracts.

Place your order now for this authoritative book; the coupon below — with Refund offer — is for your convenience.

576 Pages . . . 317 Essential Tables
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The 8 1/2" x 11" page size provides space for large-scale, easy-to-read charts which eliminate or greatly simplify your calculations.

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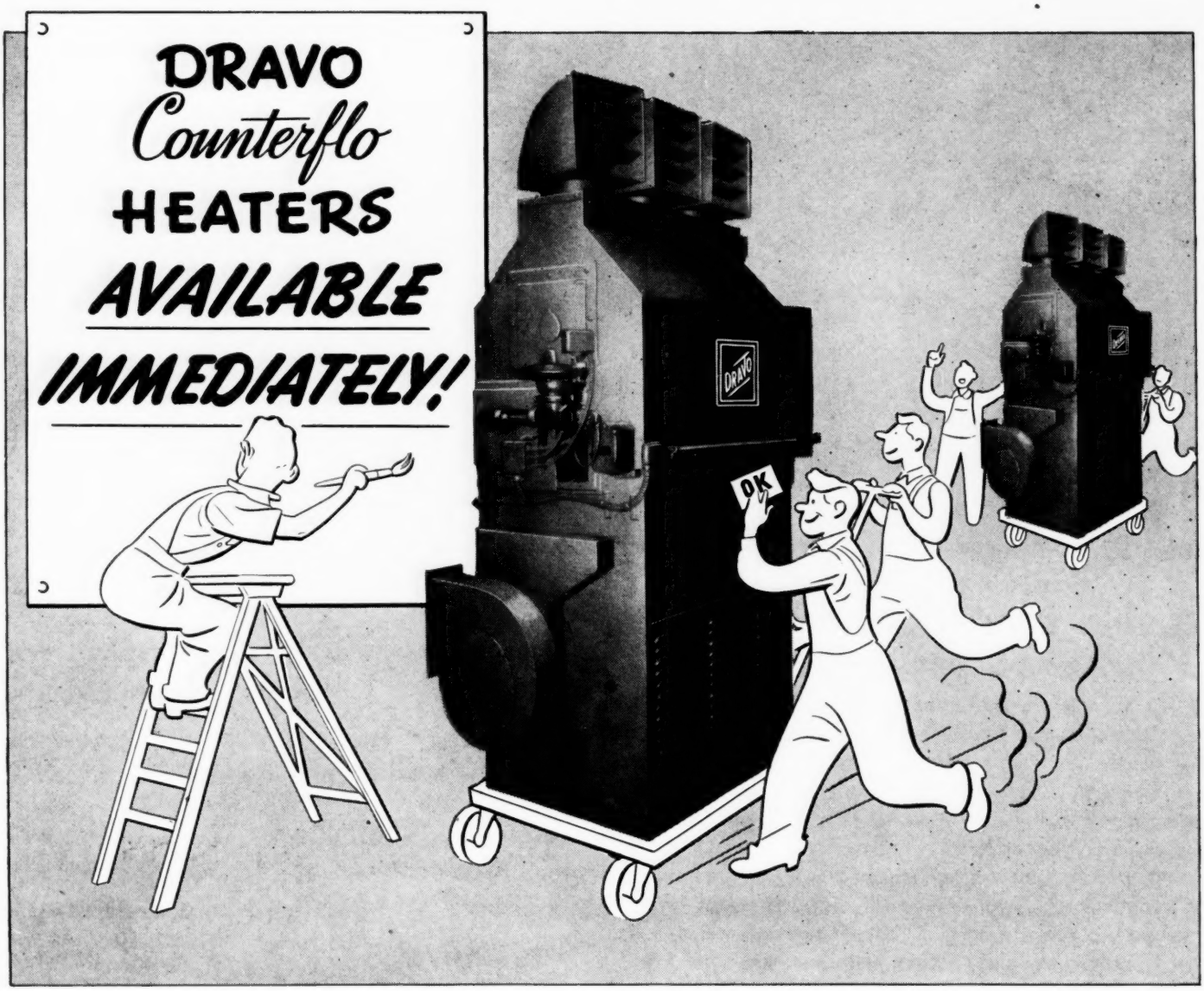

NOW—Dravo *Counterflo* Heaters can be shipped promptly from stock.

AND—Immediate availability means that you can take advantage of the summer air-circulating feature right now. You simply flick the selector switch and the large fans instantly go to work to help maintain comfortable working conditions for employees. Even more important, you'll be prepared in advance for next heating season.

NOW—The Dravo *Counterflo* Heater is listed by Underwriters' Laboratories and approved by the American Gas Association.

In thousands of industrial and commercial establishments you'll find Dravo *Counterflo* Heaters establishing records for efficiency and economy. They'll prove their worth to you, too, and they can be

SHIPPED IMMEDIATELY FROM STOCK for Winter Heating and Summer Ventilating.

For quick action call the Dravo Representative listed under "HEATERS" in your classified telephone directory, or contact Heating Section, Dravo Corporation, Pittsburgh 22, Pennsylvania.

Dravo also manufactures the DRAVO CRANE CAB COOLER *for air conditioning hot-metal crane cabs.*

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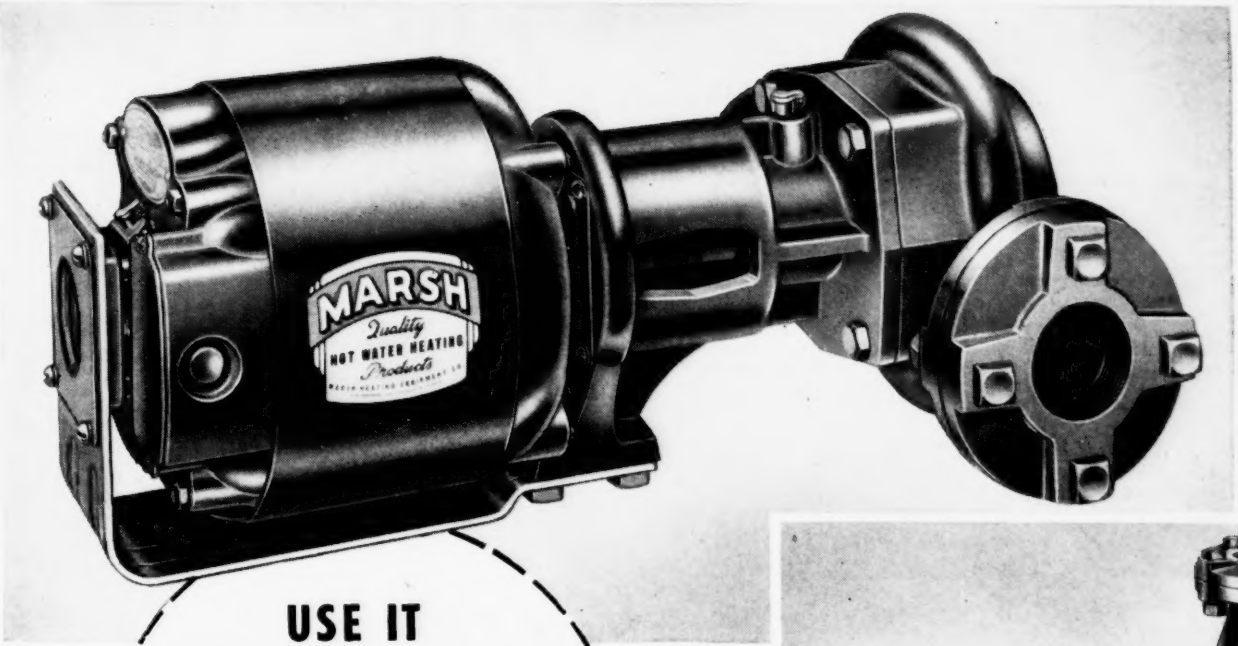
DRAVO



USE IT HORIZONTALLY— OR VERTICALLY

Marsh Two Position Circulating Pump

Here's a circulator for hot water heating systems that is quickly adaptable to either vertical or horizontal lines. It is equally efficient in either position. The change in flow is speedily and easily accomplished by removing four bolts and swinging the pump into the desired position, as shown.

Quality construction and long-life design throughout distinguish this pump. High hydraulic efficiency is obtained by the balanced die-cast construction of the bronze impeller, which results in exceptionally close fit to the bored diameter of the body.

The assembly is outstandingly sturdy, for trouble-free operation. A special rubber coupling, with brass inserts, is secured to the motor shaft and pump shaft to prevent any transmission of vibration. A retainer ring, plate, and gasket secure the pump shaft in the bearing housing on the motor side.

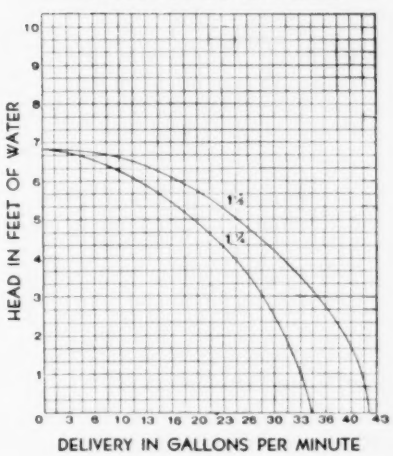
Proper alignment of the motor is maintained by securing it to a steel support and cushioning it in rubber shock absorbers. This motor, a continuous-duty, 1/6 H.P., single phase, 60 cycle, 100 volt, is equipped with an automatic overload relay. It is guaranteed for 18 months against defective materials and workmanship.

Positive lubrication at all times is insured, since the pump shaft rotates in an oilite bearing which is fed through an oil cup in the housing.

A carbon seal and a neoprene rubber seal surround the pump shaft to form a water tight seal, preventing water from entering the bearing assembly. Tension is maintained on this seal by a spring, and a highly finished bearing surface is maintained between the carbon seal and the bearing housing.

Every pump is given a running test to insure trouble-free operation.

CIRCULATOR CAPACITY CHART



No.	Pipe Size	Std. Motors 110 V, 60 Cycle Single Phase	Face to Face	Approx. Shipping Weight
MC-1	1¼"	1/6 H.P.	8-11/16"	44#
MC-2	1½"	1/6 H.P.	8-11/16"	44#

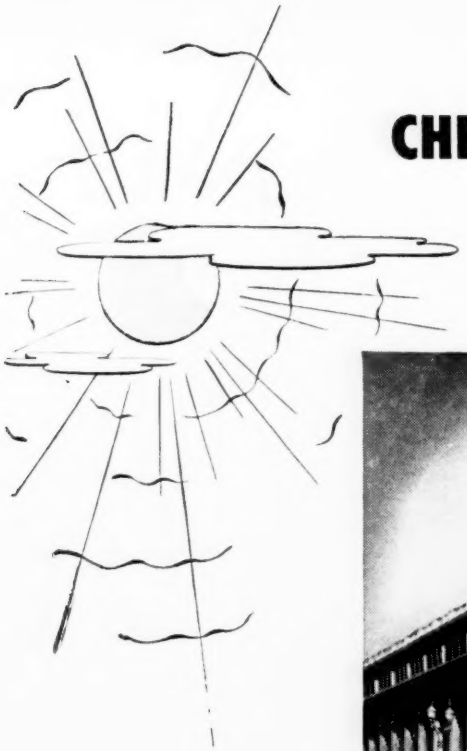
MARSH HEATING EQUIPMENT COMPANY

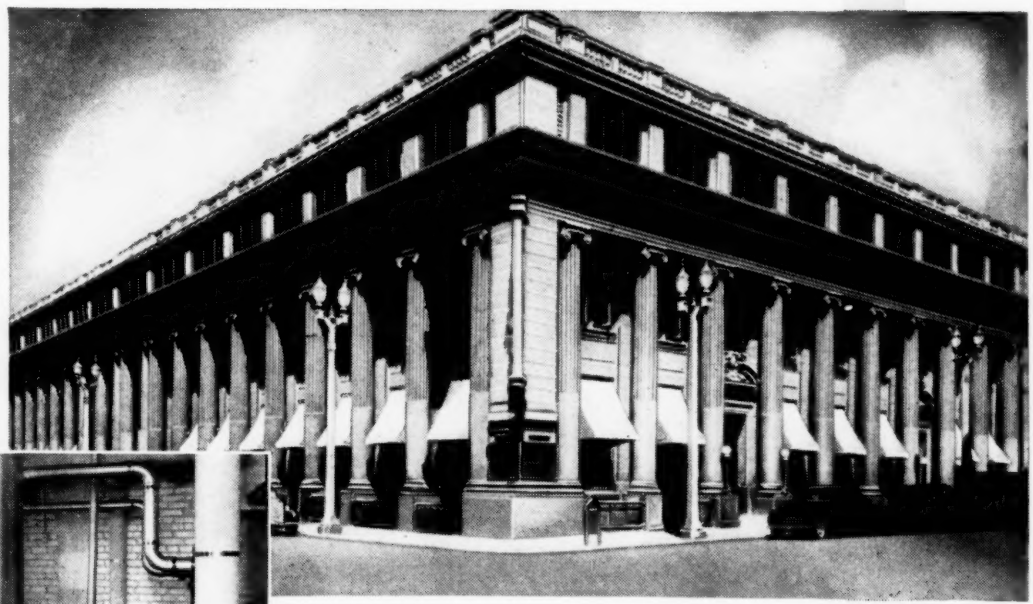
Quality Heating Specialties

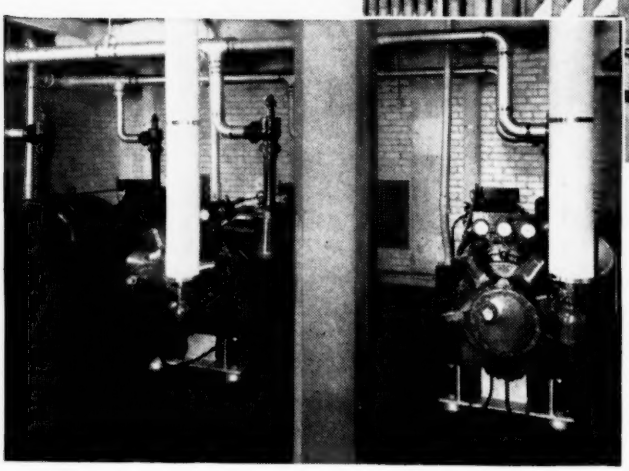
Division of Jas. P. Marsh Corporation, Dept. , Skokie, Illinois

Since 1865

CHRYSLER AIRTEMP AIR CONDITIONING TAMES THE ST. LOUIS SUN!







Bank Beats "Midwest Heat" With Equipment Totaling 275 H.P.—Reports Improved Worker Efficiency, Better "Public Relations"

● Ten years ago—in 1938—the Mercantile Commerce Bank and Trust Company of St. Louis installed their first 75 h.p. Chrysler Airtemp unit to bring cool relief to the third floor of this building, situated in one of the nation's hottest summertime cities. So excellently did this equipment perform that Chrysler Airtemp was again chosen—in 1940—to cool the main banking floors—and again in 1948, to air condition the new Executive Offices and Loan Department.

Again and again, Chrysler Airtemp Air Conditioning units win out through superior performance, efficient operation, and low maintenance costs, on every type cooling job—large or small. For further information, call your Airtemp dealer today...or write us direct.

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AIR CONDITIONING • HEATING • COMMERCIAL REFRIGERATION

AIRTEMP DIVISION OF CHRYSLER CORPORATION

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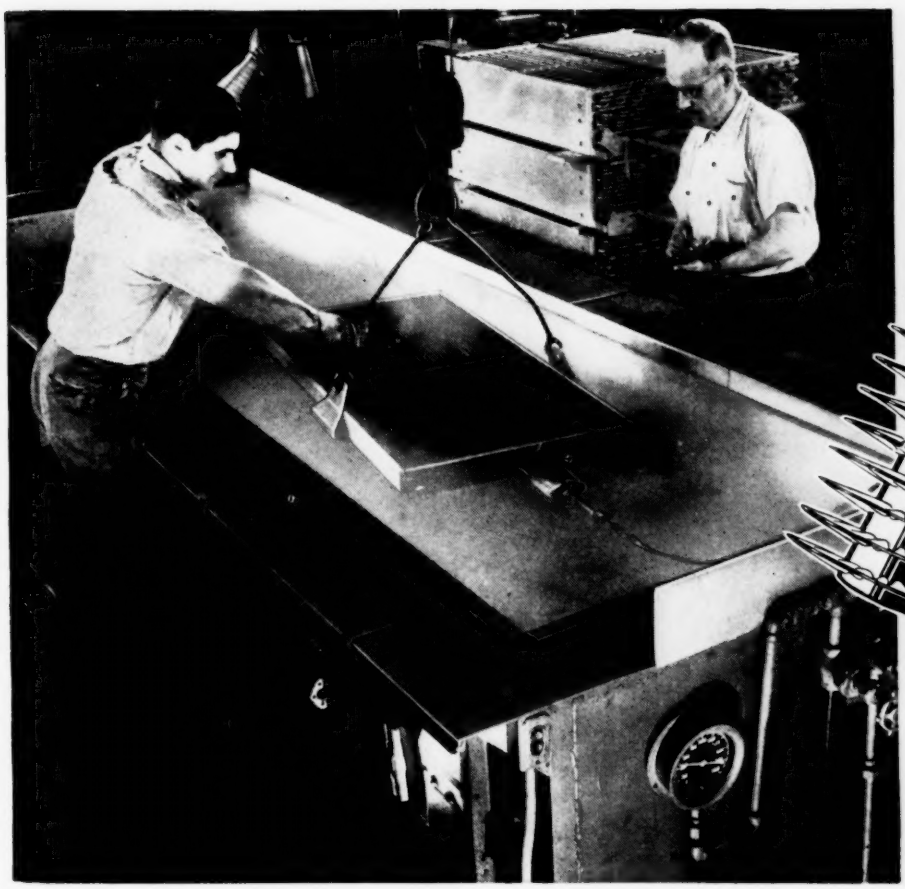
CHRYSLER AIRTEMP
DIVISION OF CHRYSLER CORPORATION

WHY YOU CAN *DEPEND* ON AEROFIN...



- **Durability**
- **Dependability**
- **Maximum Efficiency**

THESE ARE THE PRODUCTS OF AEROFIN EXPERIENCE

These men are looking for air bubbles . . . they are testing Aerofin heat transfer coils with air pressure for structural defects.

If there are no bubbles, it means the immersed Aerofin unit has withstood the terrific strains of steam and hydrostatic pressure tests and is ready to give you long, efficient service.

Your assurance of dependability is Aerofin's rigid testing . . . backed up by selected materials and advance design. Every unit is completely tested.

Another part of the same story of leadership is the accuracy of the famous Aerofin ratings . . . good for the life of the unit.

All this effort is to maintain and improve Aerofin's leadership in the manufacture of high efficiency heat transfer coils for all heating and cooling applications.

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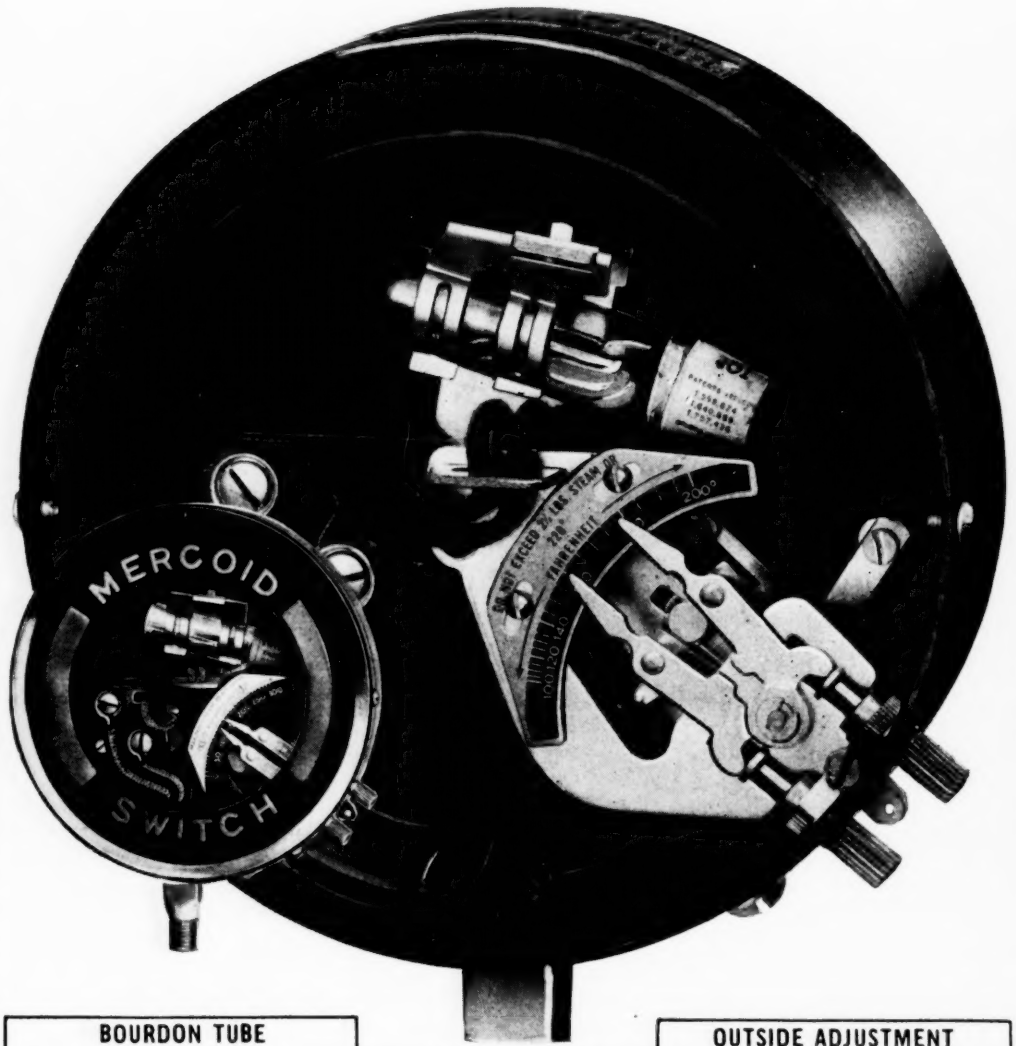
MERCOID

TEMPERATURE & PRESSURE CONTROLS
DESIGNED FOR THE JOB



BOURDON TUBE
(Hidden back of cover)
The Bourdon tube is the actuating element of the control. It is the oldest known, tried and proven element, having been used in gauges for many years.

DA Temperature Control

NOTE THE FEATURES

OUTSIDE ADJUSTMENT
The outside double adjustment with the calibrated dial and pointers is a convenient feature, making it very easy to set the required operating range, plainly visible on the dial. All guesswork is eliminated.

MERCURY SWITCH
Hermetically sealed mercury switch is used. They cannot be affected by dust, dirt or corrosion; nor are they subject to open arcing, oxidation, pitting or sticking of contacts, all common causes of contact trouble. This switch will give better control service and longer control life.

GLASS FACE
The glass face on the cover permits seeing the entire operation of the control in plain view. One can always tell whether the switch circuit is open or closed, a great convenience whenever servicing becomes necessary.

See catalog for detailed information.

THE MERCOID CORPORATION, 4213 BELMONT AVE., CHICAGO 41, ILL.

Manufacturers of dependable automatic controls for over a quarter of a century

To Help You Sell More—

Curtis AIR CONDITIONERS Are Advertised in the "SATURDAY EVENING POST" "TIME"

AND OTHER LEADING MAGAZINES

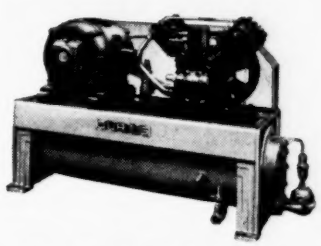
Starting April 24, Curtis Air Conditioners will be featured in full pages in color in the Saturday Evening Post and Time presenting the advantages of Curtis "Comfort Zone" Air Conditioning to more than 5,500,000 readers.

Here's your opportunity to reap the benefit of the great selling and merchandising power of these outstanding publications—reaching your major markets.

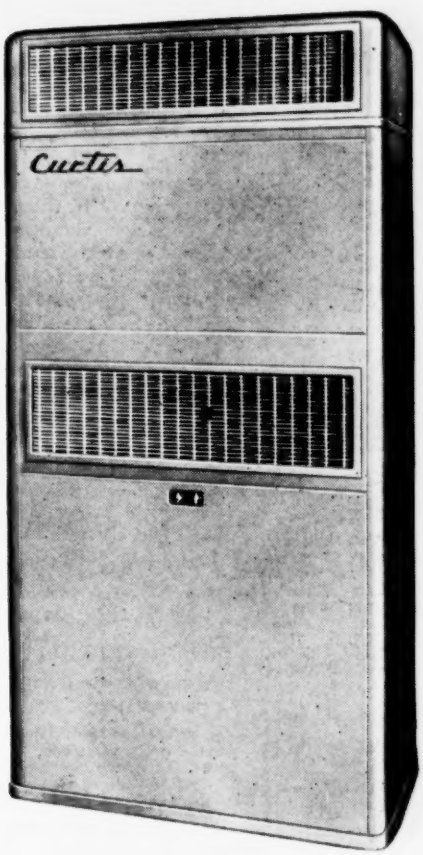
Sound design and engineering have proven Curtis units to be ideal for stores, offices, taverns, drug stores, apparel shops, beauty parlors, restaurants and many others.

It will pay you to get set to sell this vast and rapidly growing market *now.*

Write to Curtis for full information on how *you* can tie in with Curtis' new national advertising plans and assure more air conditioning sales and profits for 1948.



Curtis Condensing Units for Commercial Refrigeration—¼ to 30 H. P., air and water cooled.



Curtis Air Conditioning Units 3, 5, 7½, 10 and 15 Tons.

Curtis

REFRIGERATING MACHINE DIVISION

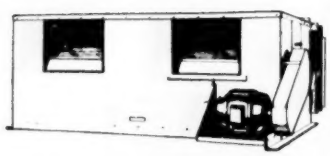
of Curtis Manufacturing Company

1999 Kienlen Avenue • St. Louis 20, Mo.

AB-597

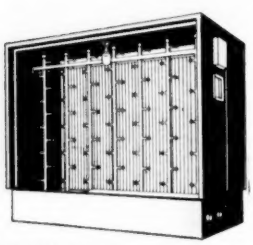
94 Years of Precision Manufacturing

Where Were You in the Summer of 1924?



UNIT AIR CONDITIONER

Can be equipped to provide one or all functions—heating, cooling, humidifying and de-humidifying. Available in ceiling or floor models in 9 capacities up to 12,000 CFM.



AIR-WASHERS

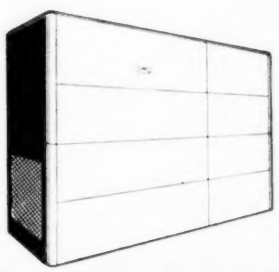
Single and double stage air-washers provide an excellent means of air cleaning, cooling, humidifying and de-humidifying. All steel, arc-welded construction throughout.

We merely ask the question to emphasize a point. In that year, 1924, usAIRco was very active in the Air Conditioning business. We were serving the first industry that made a partner of comfort cooling—the moving picture industry.

There weren't too many people in the Air Conditioning business in 1924. And while usAIRco never laid any claim to inventing Air Conditioning . . . we've been in it a long time . . . if not at the birth of it, then surely in its early years of development, refinement and growth. usAIRco engineers have made some important contributions to the industry.

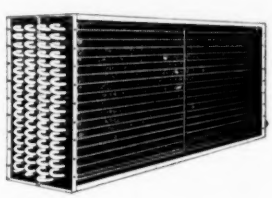
Think back to 1924 . . . and from then till now usAIRco has acquired a sixth sense for the design and manufacture of good equipment . . . and for the natural and simple application of that equipment to Air problems . . . cooling, heating, ventilating, humidity control.

The years from 1924 to the present haven't all been glory years. It required an instinct for survival to stay around which is another way of saying that it is a habit with usAIRco to go all out to serve a customer. If you'd like to experience that type of service, just send us an inquiry.



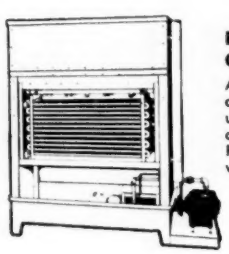
REFRIGERATED KOOLER-AIRE

Cooling and de-humidifying units, compressor and evaporative condenser provide a balanced assembly in a single cabinet. Supplied in three sections if desired for easier installation.



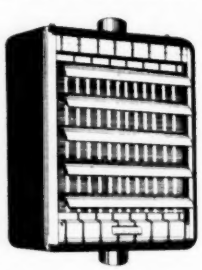
COILS

Complete line of steam coils for heating (standard and non-freeze type), water coils for cooling and heating and direct expansion coils.



EVAPORATIVE CONDENSER

An efficient, economical unit for condensing refrigerants. Also used industrially for cooling, quenching and tempering oils. Permits savings of 95% in water costs.



UNIT HEATER

Suspension type unit heaters, for use with steam or hot water, provide flexibility of use and low cost operation. All-copper heating element promotes maximum heat transfer.

BLOWERS

Forwardly curved type ventilating fans are engineered for quiet operation. Backwardly inclined types are designed for installation where non-overloading characteristics are required.

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UNITED STATES AIR CONDITIONING CORPORATION

COMO AVE. S.E. AT 33RD ● MINNEAPOLIS 14, MINN.

Washington News

LORING F. OVERMAN

WASHINGTON happenings of greatest interest to the heating, ventilating and air-conditioning industries during April were the "settlement" of the coal stoppage, and Senate passage of the Taft-Ellender-Wagner long range housing bill. The action signifies nothing final on either of these projects, but as a progress report, may be adjudged as favorable by those whose future is linked with increases in steel production and expansion of construction.

Housing Bill Status

The T-E-W housing bill, in substantially its present form, has been passed by the Senate in two previous Congressional sessions, only to be pigeon-holed upon reaching the House of Representatives Banking and Currency Committee. Current indications are that the committee will not be permitted again to prevent the bill from coming up for consideration on the House floor. Taking a tip from Representatives who forced the oleomargarine tax repeal bill out of a hostile Agriculture committee by securing the required 218 names on a petition demanding House floor action, proponents of the housing bill were also signing up petitioners as April ended.

Apparently yielding to this threat, the House Banking committee scheduled a week of hearings on the bill to start May 3, and committee chairman Jesse P. Wolcott (R. Mich.) predicted a housing bill "in some form" would pass Congress at this session. His limiting phrase has been interpreted to mean the House Committee may report a bill minus the controversial public housing feature, which proposes Government ownership and operation of 500,000 low-rental housing units for tenants who cannot afford higher rents.

A conference committee would then attempt to iron out differences between the Senate and House versions in an effort to reach a compromise acceptable to both Houses. It would appear that the T-E-W bill is nearer to final passage than ever before, although it may still become necessary to remove from it the disputed public housing feature, which could later be discussed as a separate measure.

As passed by the Senate, the following are highlights:

1. The Federal Housing Administration's home loan insurance program would be extended for 11 months, with FHA authorized to insure additional loans totalling $2 billion—half to be allocated to rental construction. The FHA would continue to guarantee repayment up to 90% of mortgages on new dwellings.

2. The RFC is authorized to resume buying of GI and FHA home mortgages, to renew the "secondary market" for such loans, and encourage banks and other lending institutions to make loans for building private dwellings.

3. To attract private capital into construction of rental housing for families of moderate and low income, large-scale investors in such projects would be guaranteed an annual profit of 3½% on their outstanding investment.

4. Housing cooperatives would be allowed liberalized FHA loan insurance of up to 95% on veterans' coops, and up to 90% on other coops, over 40 years at 4% interest.

5. A slum-clearance feature provides a system of loans and grants to help local communities buy and clear land in run-down areas and prepare plans for development. Subsidies totaling $500 million are provided for this purpose, and 45-year loans totaling $1,010,000,000.

6. FHA insurance is authorized to provide interim credit for pre-fab houses after the house has left the plant and up to the time it may be erected on the site, when the regular mortgage becomes available.

7. Technical research is authorized to find ways of cutting housing costs and promoting standardized building codes and regulations.

Proponents of the bill say it is designed to encourage the building of 15,000,000 housing units in the next 10 years, many of them multiple units of the types of interest to readers of this column. Financial inducements to private builders are numerous, and chief controversy has centered around the public housing section, which proposes 500,000 units in the next five years. Opponents of this feature contend that it would ultimately cost more than five billion dollars, and would deal with "a social and welfare problem instead of a housing problem."

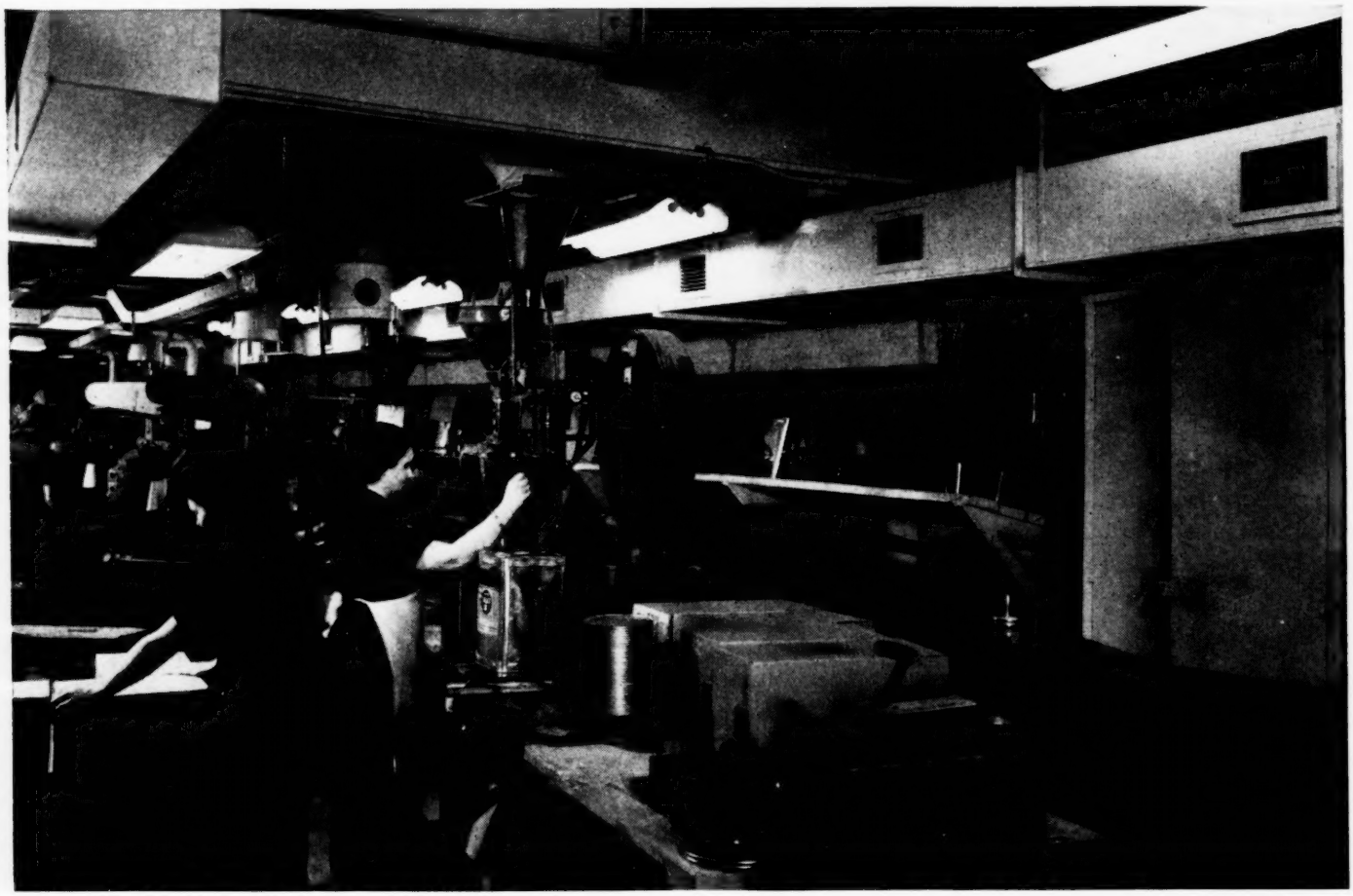
Interesting sidelights prior to Senate approval of the bill were compromises agreed upon by Senator Taft and Senator McCarthy, the latter a strong opponent of public housing. The Taft-McCarthy compromise would bar discrimination against relief applicants for low-rental units, require that "greatest need" be considered, and actually oust from public-housing units those whose incomes had climbed above the specified limits. Also included in the Senate bill, at the suggestion of Senator McCarthy, was authority for the government to pay half the cost, up to $10,000, for specially equipped houses designed for wheel-chair confined veterans.

Code Standardization

One of the objectives of the T-E-W bill—the simplification of building codes—came in for additional study in Washington during April at an initial organization meeting of the Construction Specifications Institute. The new organization is composed of specification writers for Federal, State and local governments, private organizations, architects, and teachers or supervisors of specification writing.

In announcing plans for a study to set up uniform

HUMIDITY CONTROL
safeguards industrial chemicals



Air-conditioned packing room in The Davison Chemical Corporation plant. Ducts were made from Beth-Cu-Loy Sheets. Sheet-metal contractor: Lloyd E. Mitchell, Inc., Baltimore.

Some chemical products quickly lose their effectiveness in moist air. Desiccants, in particular, pick up moisture from surrounding air and become saturated to the point where they are temporarily inactive. In order to safeguard such substances they must be processed and packaged in air-conditioned plants.

An interesting example of this type of product is Silica Gel, manufactured by The Davison Chemical Corporation.

Silica Gel is a highly-porous, granular chemical product used in many industries to dehydrate or remove moisture from gases and liquids. It is also used in "dehydrated packaging"—a method which prevents corrosion during shipment or storage of metal products. To keep this material uniformly active during packaging operations, Davison uses a modern central-station air-conditioning system to maintain constant low humidity and comfortable temperature.

The ducts that carry conditioned air through this plant are made from Beth-Cu-Loy Galvanized Steel Sheets. Containing 0.20 to 0.30 pct copper and coated with Prime Western zinc, these sheets have the superior resistance to atmospheric corrosion needed in industrial installations of this kind.

From the contractor's standpoint Beth-Cu-Loy Sheets make fast work of any duct job. They handle easily . . . form smoothly . . . make sound lock joints . . . solder readily. Priced at little more than ordinary galvanized grades, Beth-Cu-Loy Sheets are well worth the difference.

Beth-Cu-Loy
GALVANIZED
Steel Sheets

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

★ BETHLEHEM STEEL ★

building codes throughout the nation, James B. Moore, first president of the organization observed:

"Non-uniform building codes throughout the United States have long been recognized as a stumbling block facing efforts of the nation's home builders to solve the housing problem. These same building codes, varying from city to city, present problems to public builders as well as private builders. It is a task that we, as specification writers, are giving top priority."

Mr. Moore, chief of the specifications review unit, division of hospital facilities, United States Public Health Service, will direct activities of the institute with the assistance of the following officers: Carl J. Ebert, head of architectural specifications section, Bureau of Yards and Docks, Navy Department, vice-president; Francis A. Updegraff, architectural engineer, construction division, Veterans' Administration, secretary-treasurer.

Directors elected included Joseph J. Accardo, chief of specifications division, municipal architects' office; C. Warren Bogan, consulting engineer; H. S. Brightly, chief of construction specifications unit, engineering division, Department of the Army; Fred L. Knoblock, chief of specifications section, A. E. division, Public Buildings Administration; C. J. Poiess, project manager, commercial standards division, National Bureau of Standards, and J. H. Swafford, chief of specification section, construction division, Veterans's Administration.

The measure is now the Taft-Ellender-Wagner bill, not the Wagner-Ellender-Taft.

Steel the Keystone

In facing another preparedness program of considerable size, the amount of steel to be shared by armament and by civilian industry will again determine how much of everything will be made. First emphasis, it appears, would be on aircraft, with 22,500 additional tons of steel required if the smaller of two programs now under consideration is adopted; 82,000 tons if the so-called 70-group air force is authorized.

These amounts do not seem particularly large against a potential supply of 64,000,000 tons for 1948. Coupled with other probable armament demands, however, the total could be sufficiently important to be a drag on a total supply now inadequate to meet domestic and export civilian needs. Obviously, some demands would have to give way, and there are indications that those industries which took the rap in World War II would again be given the nod—automobiles, refrigerators, washing machines, toys, sporting goods, bicycles and non-essential products (whatever that may mean).

If shipbuilding were again to be an important factor in the armament program, all estimates of the outlook for civilian production would have to be revised. During 1947, shipbuilding took only .6% of available finished steel. In 1942 and 1944, respectively, its take was 16.6% and 18.8%. Administration has proposed a shipbuilding program which might get under way in 1949, but little change this year is likely.

Coal and Steel

The nation's dependence upon steel in peace and in war, brings us back to the first paragraph of this column, in which the uneasy settlement of the coal stoppage is mentioned as important to the heating, ventilating and air conditioning industries. Hardly a week after the "settlement", and only 24 hours after John L. Lewis had been chastised by the court, coal mine operators sued to set aside the pension agreement on grounds that the 10-cent per ton royalty just couldn't support such a distribution.

This John Lewis already knew, so the pattern seems clear. Raise the royalty payment. Upping mine wages upon expiration of the present mining contract on June 30 is also an anticipated Lewis demand. And with reserve stocks low on June 30 as the result of the recent stoppage, the miners' bargaining position will be strong. So another strike threat in June, with increased royalty, upped wages, and a coal price rise is likely.

The current threat to coal, and to steel, likewise affects oil—which wants its steel allotments doubled in 1948 to take care of needed expansion. In cutting coal supplies and thereby curtailing steel, John L. is in a position to take a back-handed slap at a probably-hated competitor, petroleum products. How devious the ramifications of industrywide bargaining.

Oil Industry Alert

That the petroleum industry is aware of its precarious position was evident during April when Dr. Robert E. Wilson, chairman of the board of the Standard Oil Co. of Indiana observed that the oil burner industry had "succeeded too well." Its sales in 1947, he noted, were at a rate nearly five times the average for the 10 prewar years. The demand for heating oil has reached a point, he said, where the product is no longer a by-product of gasoline, but a main product.

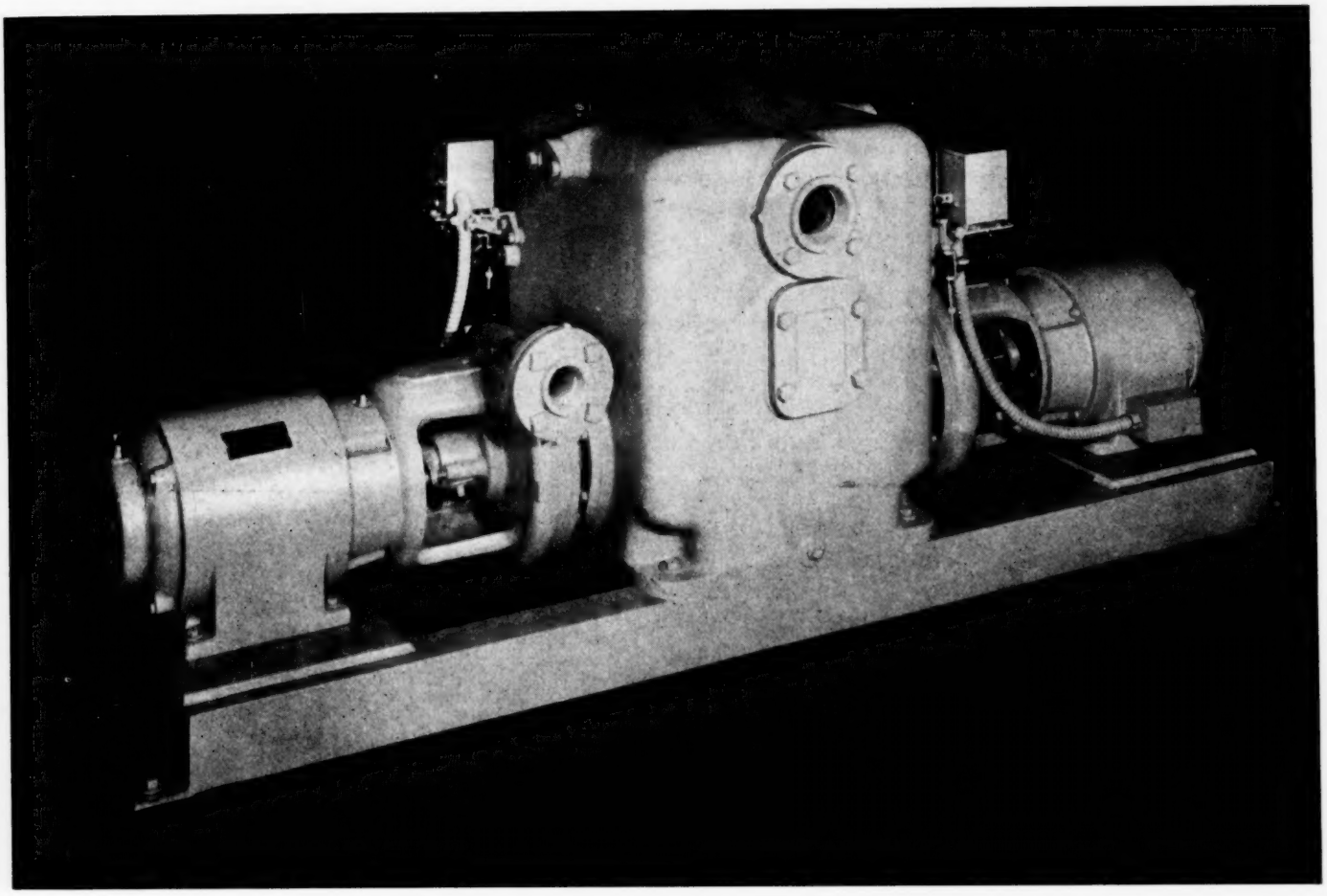
"Until pipe lines and other facilities are completed to make it possible for the Middle East to supply most of Europe's needs," he said, "our industry will not be able to take care of further increases in heating oil demand of anything like the magnitude of the increases we have met during the last two winters. Certainly the time has come for the oil heating industry and the petroleum industry to sit down and counsel together on where they are going."

He added that natural gas and coal, with reserves enormously greater than those of oil, will have to take up the bulk of any further increases in the home heating load.

Re: Synthetic Fuel

Meanwhile the Army Engineer Corps announced in Washington during April that it has completed Step 1 of its synthetic fuel production program (proving the practicability of producing oil and gasoline out of coal, oil shale and natural gas) and is now ready for Step 2. This will include a country-wide survey of suitable regions for commercial-scale production, to be readied in case of emergency.

MAXIMUM EFFICIENCY FOR STEAM HEATING SYSTEMS ON HEATING, DRYING AND PROCESS WORK.



JENNINGS CONDENSATION PUMPS

Designed for steam systems on heating, drying, or process work, these pumps offer the most reliable and efficient means of returning hot condensate to boiler or hot well. In many cases these pumps will save costly installation of boilers in a pit to provide gravity flow of returns from basement radiators and heating devices.

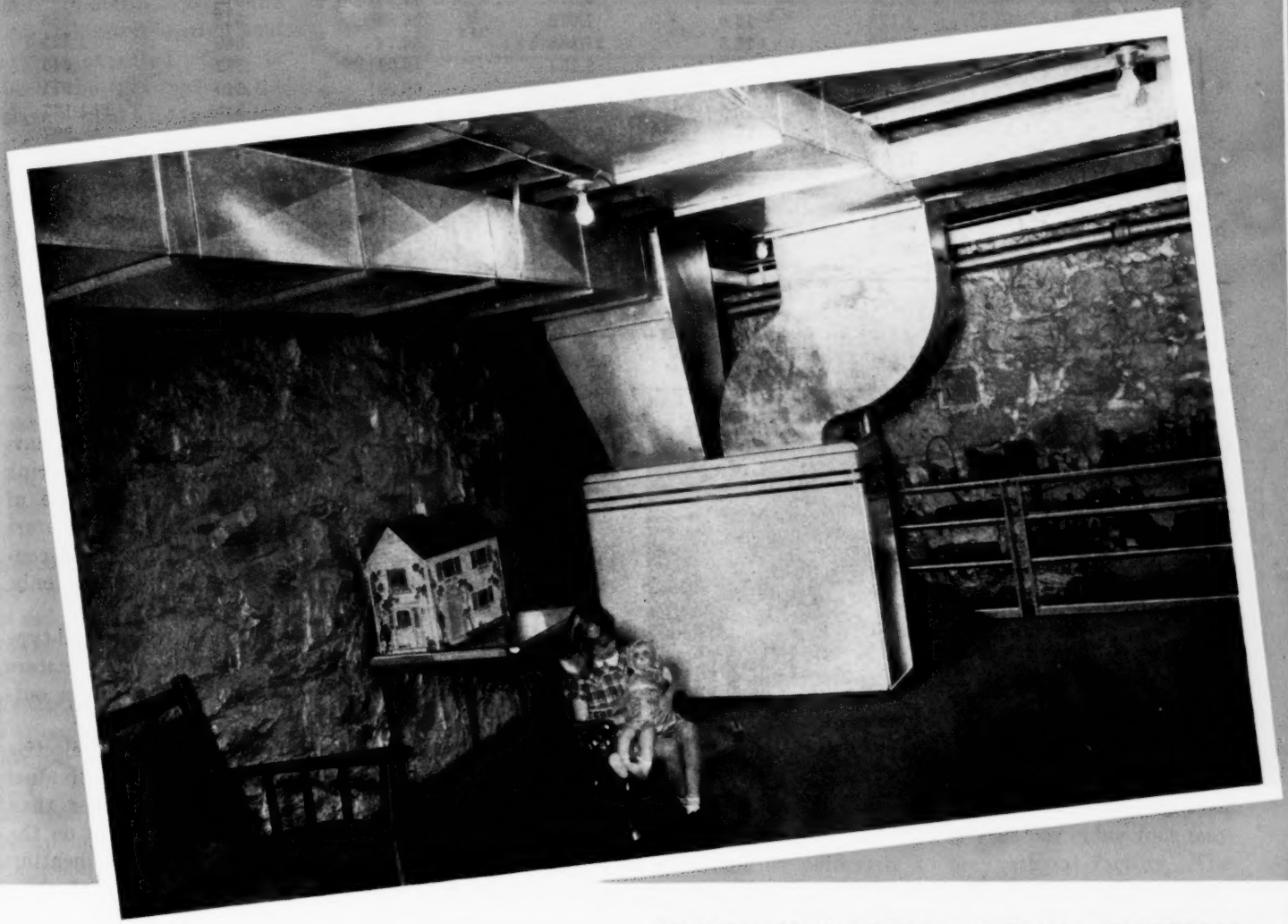
The Jennings Condensation Pumps are sturdy and compact in construction, and combine receiving tank, pump and driving motor in a single assembly. Pumps are bronze fitted throughout, with tobin bronze shaft. The pumping impeller is of special design, made possible by our wide experience with return line heating pumps, and is especially adapted for handling hot water with the greatest possible efficiency.

Full automatic control is furnished by means of a ball float and float switch mechanism mounted on the receiving tank. All wiring is made up at the factory, and it is necessary only to connect the pump to the system and hook up the leads. Complete information regarding these economical pumps sent promptly on request.

THE NASH ENGINEERING COMPANY

SOUTH NORWALK, CONNECTICUT, U. S. A.

Heating by Electricity in the Tennessee Valley Area



BUFORD H. MARTIN and T. W. NEWBERRY

The Tennessee Valley Authority area has a moderate but variable climate with an average of 2,500 degree days in the extreme southern portion, and approximately 4,500 degree days annually along the northern boundary. Temperatures below fifteen degrees are unusual anywhere within the area. House heating in this locality by electric power is presented as an engineering problem. Data are included on power consumption and costs.

RESIDENTS of the Tennessee Valley area are conscious of low electric rates, and have become enthusiastic in the use of electricity for house heating. Although TVA has never actively promoted electric house heating, this method of heating became a reality soon after the advent of TVA within the region. At the present time there are at least 6,000 electric house heating installations in the Valley.

Until recently electric heating was confined to comparatively small homes of five or six rooms, with a volume of from 6,000 to 9,000 cu ft, but within the past year or more, installations have been made in quite a number of larger homes. With few exceptions, however, all of the electrically heated homes in the Valley are well constructed, adequately insulated and weatherstripped.

Several types of installations are in use, including individual room-type unit heaters, floor furnaces, central furnaces, both warm air and hot water, panel heating, and more recently, a number of heat pump applications. Choice of the type of heating system to be used often rests upon one or more of several considerations, but usually the initial cost is the deciding one.

Unit room heater installations now predominate as a method of electric heating in this area, and with the

The authors are respectively Head, Commercial and Industrial Power Section, TVA, and Heating and Air Conditioning Engineer, Electrical Development Division, TVA, Chattanooga, Tenn.

Table 1 – Operational Data for 12 Houses in Tennessee Valley

House No.	No. of Rooms	Cubic Feet	Heating Capacity KW	Annual KWH (Estimated) Heating	Annual Heating Cost in Dollars	Average Cost—Cents per KWH	Average Cost—Cents per Cu Ft
1	4	6,853	13.0	8,875	45.39	.511	.662
2	4	4,128	12.0	7,079	36.69	.518	.888
3	4	5,050	15.5	11,803	66.74	.565	1.321
4	5	7,454	19.5	8,254	48.09	.582	.645
5	5	6,886	18.0	10,447	66.86	.640	.971
6	5	6,672	15.5	12,912	75.23	.583	1.127
7	5	6,850	15.0	12,725	68.27	.536	.997
8	5	7,500	19.0	12,204	72.01	.590	.960
9	6	9,054	26.0	18,673	116.38	.625	1.285
10	6	8,233	23.0	16,173	113.27	.700	1.364
11	6	8,655	28.5	9,280	48.01	.517	.555
12	6	10,062	22.0	13,876	87.63	.632	.871
Total	....	87,397	227.0	142,301	844.57	6.999	11.646
Average	....	7,300	18.9	11,880	70.50	0.583	0.97

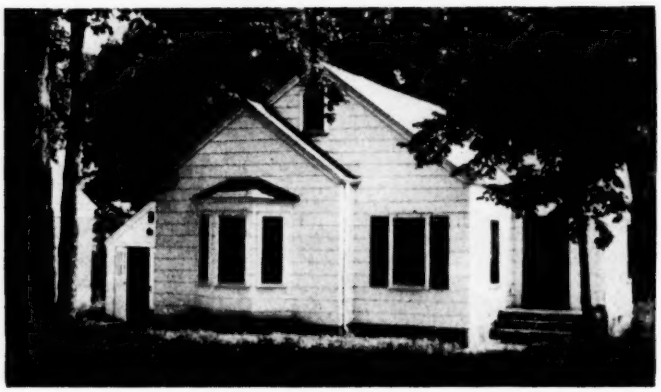


Fig. 1. A typical electrically heated house in the Tennessee Valley.

possible exception of floor furnaces, are usually cheaper, considering the original investment involved. A typical installation would involve one or more heaters in each room of the house, the heaters to be sized in accordance with the calculated heat loss on a 70F temperature difference basis. Thermostatic control is recommended for each heater, and the prospective user of electric heat is informed of the importance of insulation and weatherstripping.

This type installation offers several definite advantages, such as: Heat zoning of each room individually; better heat distribution, and, as compared to central furnace installations, the elimination of the need for a basement or utility room. In the Tennessee Valley region the frost line is comparatively shallow; consequently, a considerable saving may be realized in constructing a new home by eliminating the basement.

Typical Installation

A typical electrically heated home in the Tennessee Valley, Fig. 1, has approximately 7,000 cu ft. It is of frame construction with asbestos shingle siding. A 4 in. thickness of rock-wool insulation is used in the ceiling and outside walls, and the doors and windows are weatherstripped. The house is in a location having an average of 3,200 degree days annually. During a normal heating season an inside temperature of 75F was maintained by means of unit room heaters having a total capacity of 18 kw. An electrical consumption of 8,439 kwh was realized, for heating only, at an approximate energy cost of $45.

Fig. 2 illustrates two conventional flush wall-type heaters. It may be noted from Fig. 2 that all heaters are installed beneath or adjacent to windows in outside walls.

From the standpoint of the distributor of electric power, the use of unit room heaters with individual thermostatic control is to be preferred, rather than other types, because of a better load diversity on the distribution system. Usually 60% of the total heating capacity may be expected as a maximum transformer load for heating only when an isolated electrically heated house is served. A further improvement in the diversity is realized when a group of electrically heated houses can be served by common distribution facilities. A number of complete subdivisions in the

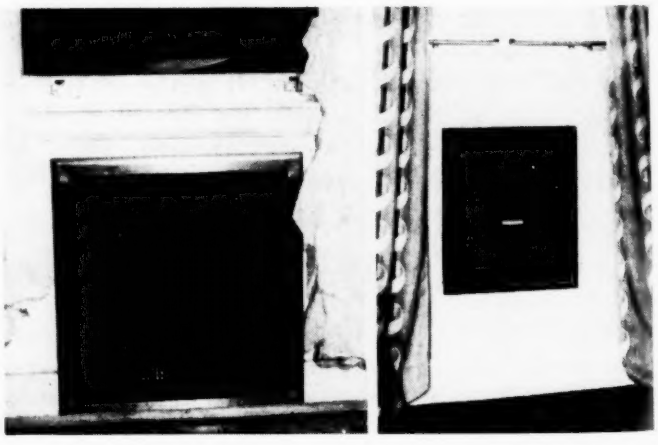


Fig. 2. Two of the flush wall type unit heaters. At left is a unit with a self-contained thermostat; one at right uses an isolated thermostat.

Tennessee Valley are now using electric heating, and it has been found that when as many as six or eight houses are served by one transformer, a loading factor for heating only, of approximately 25% of the total connected heating load may be expected. This is due to the fact that the total connected load is divided into a greater number of units, and to the greater improbability of a large proportion of the units being in operation at the same time.

Fig. 3 shows a graphic record of the loading of a transformer serving a group of 10 electrically heated houses. The total connected load includes electric cooking, refrigeration and water heating in addition to the heating load, and the graph depicts loading from all uses.

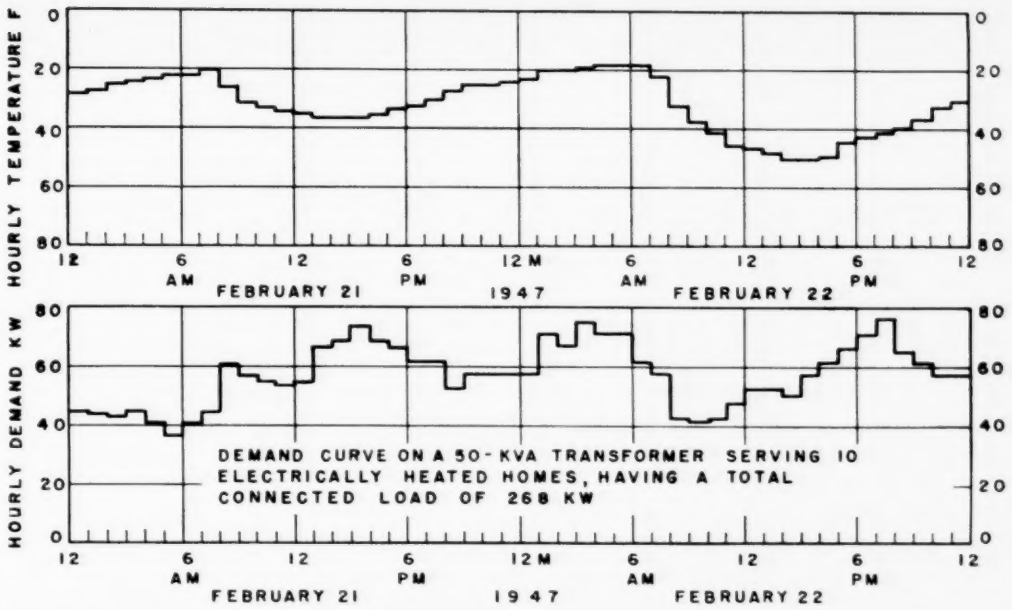

HOURLY TEMPERATURE F
HOURLY DEMAND KW
DEMAND CURVE ON A 50-KVA TRANSFORMER SERVING 10 ELECTRICALLY HEATED HOMES, HAVING A TOTAL CONNECTED LOAD OF 268 KW
12 6 AM 12 6 PM 12 M 6 AM 12 6 PM 12
FEBRUARY 21 1947 FEBRUARY 22

Fig. 3. Record of the loading of a transformer serving ten electrically heated houses.

In well-constructed, adequately insulated and weatherstripped homes, an approximate capacity of two watts per cubic foot is required if the heat loss is calculated on a 70F difference basis. It has been found, however, that larger homes require less heating capacity per cubic foot than smaller dwellings. A group of approximately 50 houses, whose heat losses and volumes were known, afforded data for plotting Fig. 4.

The energy usage of electrically heated homes naturally varies according to the living habits of the occupants. A higher operating cost is particularly noticeable when high temperatures are maintained within the house. Approximately a 5% increase in energy consumption may be expected in this area for each additional degree of inside temperature maintained.

Operational data and cost figures are presented in Table 1, listing averages of energy usage and cost of operation of 12 small homes in a region of the Valley which has averaged 3,200 annual degree days.

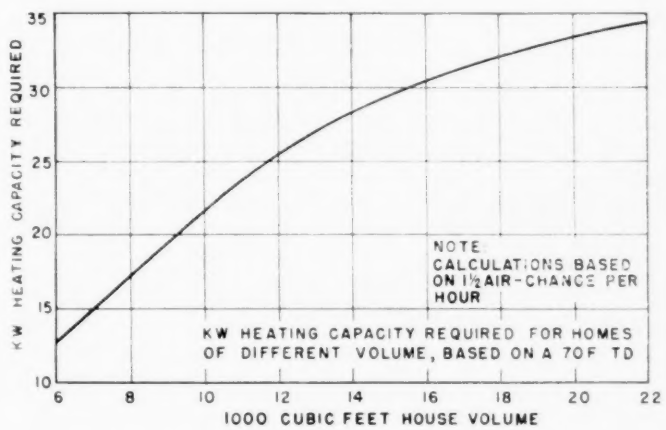

KW HEATING CAPACITY REQUIRED
NOTE CALCULATIONS BASED ON 1½ AIR-CHANGE PER HOUR
KW HEATING CAPACITY REQUIRED FOR HOMES OF DIFFERENT VOLUME, BASED ON A 70F TD
1000 CUBIC FEET HOUSE VOLUME

Fig. 4. Heating capacity required for different house volumes.

Table 2 – Basic TVA Residential Rate for Electricity

Increment	KWH per Month	Cents per KWH
First	50	3.00
Next	150	2.00
Next	200	1.00
Next	1,000	0.40
Excess over	1,400	0.75

Figures used in Table 1 represent averages from five heating seasons for all 12 houses considered. Variations in average heating cost per cubic foot may be attributed primarily to occupational factors. The average cost per kwh is also affected by variations in the inconsistancy of the use of electricity for purposes other than heating and to the fact that the cost per kwh of electricity in the Tennessee Valley is on a sliding scale. No special rate for electric house heating is used in the TVA power service area. House heating is served on the regular domestic rate in effect with each individual power distributor. Since, in general practice, the residential electric heating load is served through the same meter as lighting, cooking, refrigeration, water heating, and many miscellaneous uses, the incremental price per kilowatt-hour for heating is relatively low, averaging approximately 0.6 cent per kilowatt-hour. The basic TVA rate for electricity for residential use is listed in Table 2.

Most of the electric house heating customers in the area are served with single phase current, although some, requiring comparatively large kw capacity are supplied with three-phase current. In either case, however, with few exceptions, 230-volt heaters are used.

A number of manufacturers are now producing equipment for electric house heating and various com-

mercial heating applications. At the present time the cost of heaters, whether of the flush wall type or the plug-in type, is approximately $28 per kw of installed capacity, considering a complete residential installation. The cost of installing the heaters, including necessary wiring, load centers, thermostats, etc., is approximately $15 per kw of installed capacity for a complete installation. Thus, the cost of a complete installation in the Tennessee Valley at the present day prices might be approximated at $43 per kw of required capacity. The cost of installing electric heaters in a typical house having a calculated heat loss of 60,000 Btu per hr, and requiring a total of 18 kw in heater capacity, would be approximately $774, which is comparable to that of an automatic central heating system using other types of fuel.

Floor Furnaces

The application of the electric floor furnace differs very little from that of the unit room heater. Usually fewer are used. The typical five-room house has two or three floor furnaces according to the specific requirements of the house for good heat distribution.

A typical electric floor furnace, Fig. 5, is comprised of conventional strip heaters encased in a double metal jacket. The space between inner and outer jackets provides a cold air return from the outside periphery of floor grille to the bottom of the heater, whence air enters the inner chamber, is heated and is recirculated by gravity. A thermostat is mounted in the cold air return to provide automatic temperature control for the space in which the floor furnace is used.

Naturally, floor furnaces do not afford the same degree of heat distribution to be expected with unit room heaters, nor can individual room temperature zoning be accomplished when only two or three floor furnaces are used to heat the entire house. However, the cost of installing floor furnaces is usually less than that for other types of electric heating. Generally, the floor furnaces are easily placed in existing buildings.

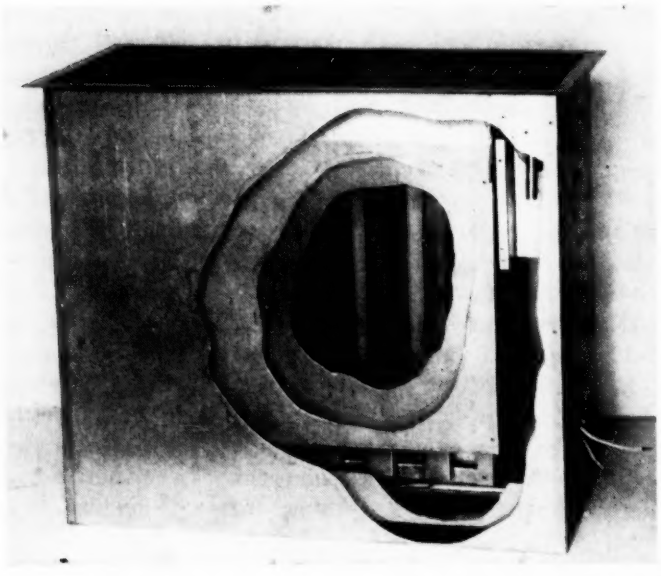


Fig. 5. Cut away view of a typical electric floor furnace.

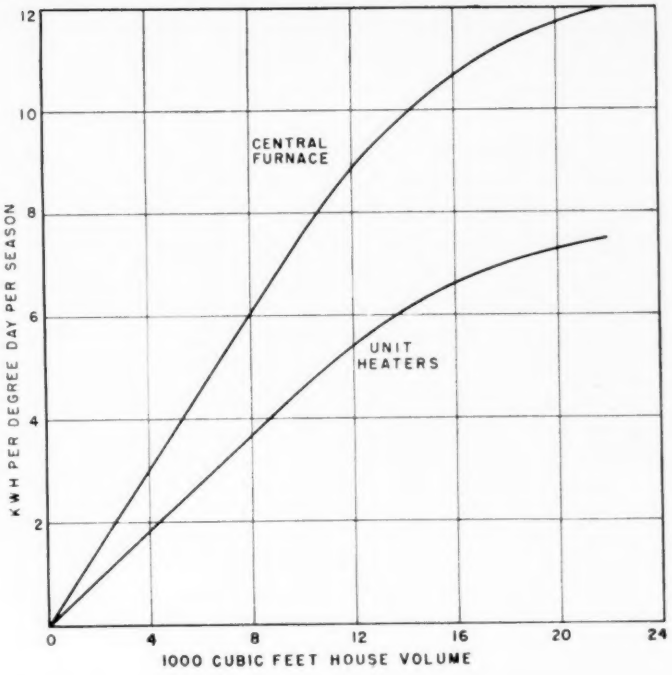


Fig. 6. Average kwh per degree day per season required with two types of heating systems in various size homes.

Panel Heating

During the past few years, there have been indications of a growing interest in radiant heating by means of heated panels. Several installations are in use whereby electrically heated hot water is circulated through piping embedded in concrete floors. Heat absorption by such heavy masonry results in a definite lag in temperature adjustment within the heated space. In most of the Tennessee Valley, outside temperature variations of as much as 30F are not unusual during a winter day. Consequently, floor panel heating when applied through heavy masonry has indicated an excessive variation in inside temperature and an accordingly objectionable operating cost.

A number of installations have recently been made in the area using low temperature heating cable embedded in plastered walls and ceilings, but at the present time no operational data are available.

A few installations have been made whereby rigid panels with an electrically conductive sheet sandwiched between are used. These panels are applied to ceilings and side walls so as to furnish a capacity of approximately two watts per cubic foot of space to be heated. One of these installations has been in operation and, although no comparative operating costs with other types of heating equipment were obtained, the user reported satisfactory operation.

Central Furnaces

Within the past year or more, many home owners in the Tennessee Valley have installed central electric furnaces to replace coal-fired furnaces. Numerous installations were made in new homes, whereby the electric furnace was accommodated in the utility room along with other major household appliances.

A typical electric warm-air furnace, frequently in-

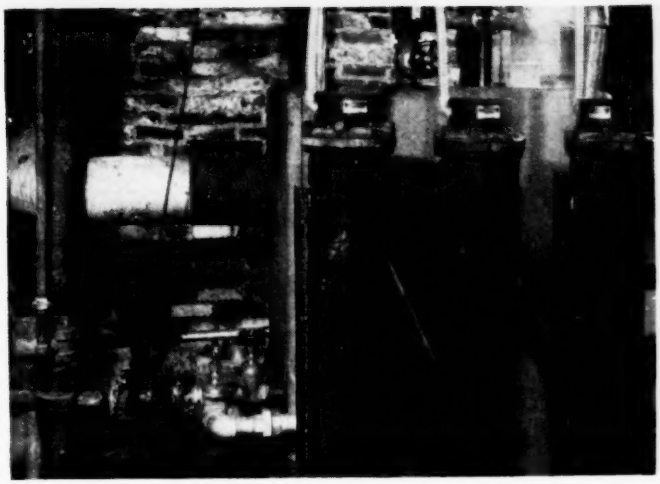


Fig. 7. Three 18kw jacketed circulation heaters piped in series installed in a residence.

stalled, has the total connected load divided between several circuits operated by a control system which regulates the heating load in accordance with the building requirements. Such a control system, rather than one permitting the total load to be all on or all off, results in better regulation of room temperature and provides a more favorable load for the power distributor.

Most of the central warm air furnaces in the Tennessee Valley use air filters and humidifiers. Some have variable speed blowers which are regulated according to the load being used in the furnace.

A somewhat higher operating cost is realized with a central furnace than with unit room heaters. This is shown by Fig. 6, which was plotted from operational data obtained from a number of electrically heated homes in this area.

The increased use of electricity by a central furnace may be accounted for by the loss of heat due to radiation from warm air ducts and by the unequal heat distribution realized by a single thermostat control. In many instances, however, the use of a central furnace may be justified by the ease of conversion from an existing heating system, whereby the previously installed duct work may be utilized. The central system makes possible the use of air filters and germicidal lamps. With further development in the use of electrostatic air cleaning, great importance may be attached to this feature.

A comparatively small number of installations have been completed this year in which coal-fired hot water heating systems have been converted to the use of electricity. At the present time no definite conclusions may be drawn as to the relative merits of this type of heating installations, but indications are that if sufficient electric capacity is incorporated, this method should prove satisfactory.

Some of the electric hot water systems employ insulated storage tanks with immersion-type heating elements, each thermostatically controlled. The use of a storage tank provides reserve heat for fast recovery, which is desirable after the room thermostat has been set back during periods of non-occupancy.

Other installations comprise the use of instantaneous or circulation-type water heaters with no storage facilities.

Three 18 kw jacketed circulation heaters were installed to supply a total connected capacity of 54 kw in a 30,000 cu ft residence with a calculated heat loss of 185,000 Btu per hr on a 70F temperature difference. Heaters were piped in series. Water flow is controlled by a conventional circulator which is connected through a room thermostat. See Fig. 7.

An expansion tank, a flow control valve, and a pressure relief valve are used as in a conventional forced circulation system. The piping diagram is shown in Fig. 8.

A two-position room thermostat is used to energize contactors which operate No. 1 and No. 2 heaters. After No. 1 heater is energized, a further drop in room temperature of approximately 2F closes the second contact of the thermostat, thus energizing the No. 2 contactor and bringing the No. 2 heater into operation. An outdoor thermostat set at 30F brings the No. 3 heater into operation along with the No. 1 heater when the outside temperature is below 30F, and if the first contact of room thermostat is closed. The hot water circulator begins operation when the first contact of the room thermostat is made. The wiring diagram of the installation is shown in Fig. 9.

As is shown by the diagrams, the total connected load of 54 kw is divided into three banks or circuits, and is brought into use only as needed according to the heat requirements of the residence.

Heat Pumps

At this time there are about 20 heat pump installations in the Tennessee Valley, all of which are Marvair units, manufactured by the Muncie Gear Works. These units are of the water-to-air type, and utilize the earth as a heat source.

Most of these installations are using bored wells, with a water head of from 150 to 200 ft, for deriving heat from the earth. Under favorable conditions, the average year-round temperature of the water in these wells is approximately 60F, and does not vary greatly from the cooling season to the heating season.

Heat transfer in the well is effected by means of a closed U-tube which is suspended into the well, and

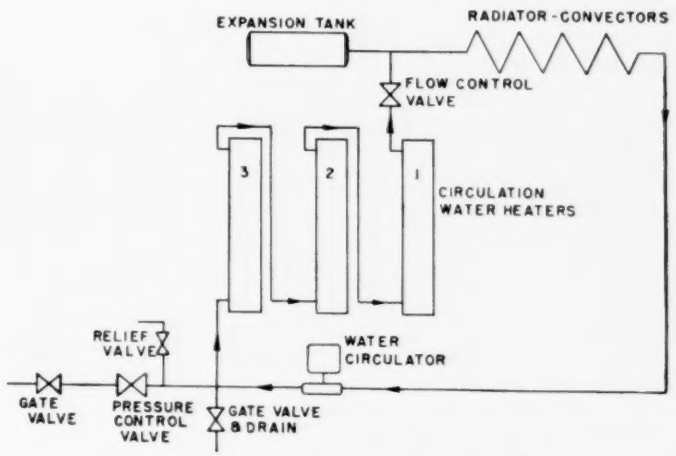


Fig. 8. Piping diagram for a group of three circulation water heaters.

Table 3 – Heat Pump Operational Data of Residence in Chattanooga, Tenn.

Calculated heat loss, 70F TD = 66,000 Btu per hr.
Inside temperature maintained = 77F.
Heat loss per degree TD = 943 Btu per hr.

	Heating Season, 1946-1947						
	October and November	December	January	February	March	April	Total
Degree Days—65F Base	456	626	652	826	684	109	3,353
Degree Days—77F Base	1,188	998	1,024	1,162	1,056	469	5,897
Btu Heat Requirement	26,850,000	22,600,000	23,200,000	26,300,000	23,900,000	10,600,000	133,450,000
Kwh Equivalent	7,870	6,630	6,800	7,700	7,000	3,150	39,150
Metered Kwh	1,570 (Estimated)	1,408	1,781	2,095	1,861	606	9,321
Performance Coefficient	5 (Assumed)	4.7	3.8	3.7	3.75	5.2	4.36
Energy Cost	$9.40 (Estimated)	$8.45	$10.68	$10.57	$11.17	$2.42	$52.69

Average Coefficient of Performance = 4.36
Btu requirements per month = Degree Days (77F Base) × 943 (heat loss per degree TD) × 24 hours.

	Cooling Season, 1947					
	May	June	July	August	September	Total
Metered Kwh	529 (Includes some heating)	518	694	1,324	814	3,879
Energy Cost	$2.12	$2.08	$2.78	$7.30	$3.26	$17.54

Total Annual Cost, Heating and Cooling = $70.23

which is connected through a circulating pump to the heat exchanger of the unit.

Water in the U-tube is brought to approximately the same temperature as that of the water in the well, and when pumped through the heat exchanger is reduced in temperature approximately 10F. The heat thus extracted from the water is dissipated through the condenser and subsequently used to heat the residence through a conventional duct system.

All units in use in the Tennessee Valley have a 3 hp compressor, and have a capacity rating of approximately 60,000 Btu per hr. A few of the homes using heat pumps have a heat loss which exceeds the capacity of the unit and require supplemental resistance heating. Others are using two or more units operating in tandem.

When the heat pump is used for cooling, the refrigeration cycle is reversed. The condenser becomes the evaporator and the heat exchanger acts as the condenser. Heat from the conditioned area is dissipated into the well.

At the present time an experiment is being made to ascertain whether sufficient heat transfer is possible through tanks embedded approximately 7 ft below the surface of the ground. If the experiment is successful, then the need for a well will be eliminated and the original cost of installation of the heat pump materially reduced.

Considerable informative data were collected during the past heating season from the operation of a heat pump installed in a residence in Chattanooga, Tenn. The residence has a calculated heat loss of 66,000 Btu per hr a 70F temperature difference. The inside temperature was maintained at 77F throughout the entire heating season.

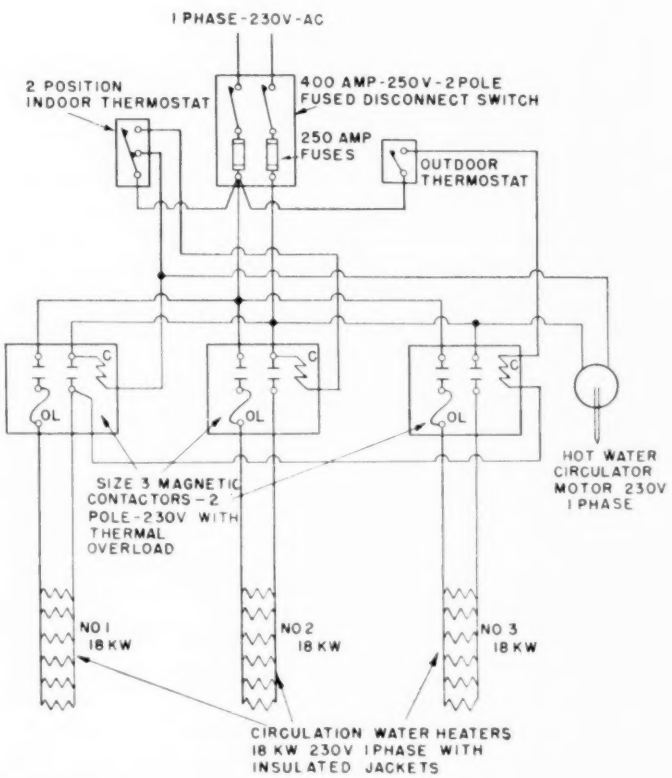

1 PHASE-230V-AC
2 POSITION INDOOR THERMOSTAT
400 AMP-250V-2POLE FUSED DISCONNECT SWITCH
250 AMP FUSES
OUTDOOR THERMOSTAT
C
OL
SIZE 3 MAGNETIC CONTACTORS-2 POLE-230V WITH THERMAL OVERLOAD
HOT WATER CIRCULATOR MOTOR 230V 1 PHASE
NO 1 18 KW
NO 2 18 KW
NO 3 18 KW
CIRCULATION WATER HEATERS 18 KW 230V 1PHASE WITH INSULATED JACKETS

Fig. 9. Wiring diagram for electric water heating.

As may be noted from tabulations in Table 3, an average coefficient of performance of 4.36 was attained throughout the heating season, and the total heating cost for the season was $52.69. The cost for summer cooling was $17.54, so that the total annual cost for operation, including both heating and cooling, was $70.23.

From our study of a great many actual installations, a formula has been developed which has been found reasonably accurate for calculating the power requirements for home heating anywhere within the Tennessee Valley area, assuming the use of resistance-type heating equipment. By employing the kilowatt equivalent of the calculated Btu heat loss of the building, the proper factor *F*, and the annual degree days of the locality, estimates of seasonal kilowatt-hour usage for heating may be made. The formula is:

$$\text{Kwh per season} = (\text{KW})\ (\text{Degree Days})\ F$$

Or in other words, kwh per heating season = calculated heat loss.

The factor *F*, presently being used for installations consisting of individual room units, is 0.215 and for installations of central furnaces the factor is 0.350. These factors are based on an average inside temperature of 74F being maintained.

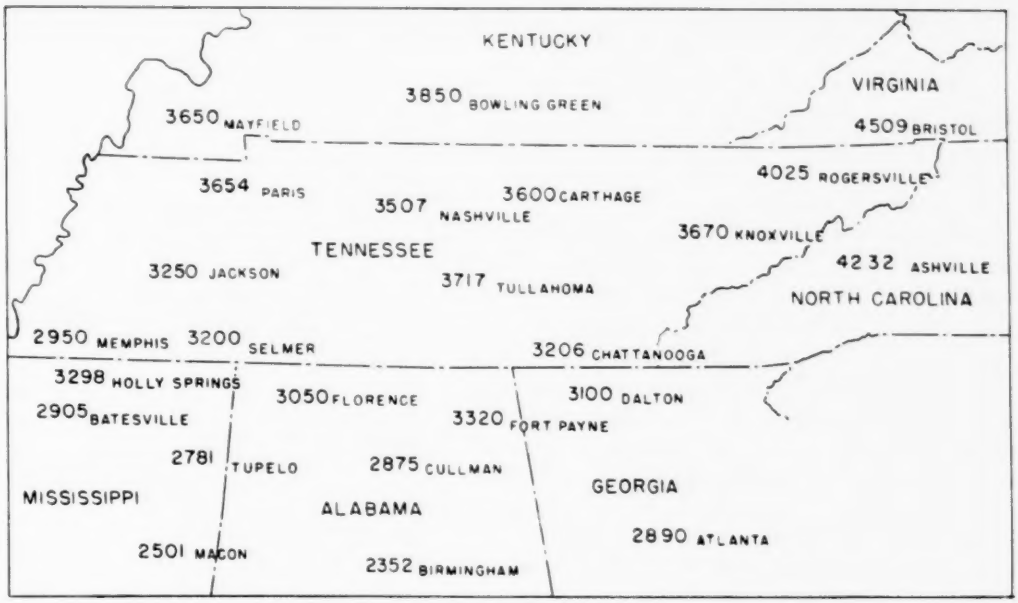


Fig. 10. Degree days for the Tennessee Valley area using a 65F base.

Fig. 10 shows a map of the Tennessee Valley with degree days applicable to various key cities.

Studies of electric house heating in the Tennessee Valley have led to a number of important conclusions, among which are these: electric house heating has many advantages over other methods of heating, which make it especially attractive to the prospective user, and under present conditions, it is only very little more expensive than other types of heating provided the cost of electricity used for heating averages less than one cent per kilowatt-hour.

Causes of High Head Pressure in Refrigeration

The four main causes of high head pressure in refrigeration may be summarized as due to insufficient water, air in the system, coated condenser coils, and refrigerant overcharge, according to service information in Chrysler Airtemp News.

Excessive temperature differential between inlet and outlet water temperatures is due to insufficient water through the condenser. The colder the supply water, the higher the temperature differential and the less gallons per minute of water is required.

Since air will not condense at the same temperature as the refrigerant gas, a false head pressure is created. To remove air or non-condensible gas from the condenser, it is necessary in most cases to go through a series of service steps to free the system from the air. On later model condensers, a fitting is provided in the shell near the top so that the spline of the gage adapter can be used to unseat the plug within the fitting, and the condenser purged.

A coating of rust, corrosion or other foreign ingredients on the inside walls of the condenser coil prevents heat transfer and results in a high head pressure. The condition can be determined by the temperature differential between the supply and return water and also the amount of water that can be circulated. If with the normal amount of water circulating through in a minute, there is little temperature differential, it is evident that dirty coils are interfering with the proper heat transfer through the coils. A cleaning compound can be circulated through the coil with a centrifugal pump. Another method is to add an inhibitor to the supply water to keep the coils in good condition.

While on some refrigeration units, it is possible to handle an overcharge of several points of refrigerant in excess of the normal operating charge, an excessive overcharge will result in an increased water consumption and high head pressure. By withdrawing part of the refrigerant charge, these conditions can be corrected.

Conductive Rubber for Space Heating

A SPECIAL form of fabric impregnated with rubber and carbon to produce what is popularly known as conductive rubber, forms the basis of a ceiling panel for radiant heating systems using electric power as the heating medium.

Commercially this material is available in rigid Uskon panels 4 ft by 4 ft and 4 ft by 3 ft; also in special sizes where required to meet achitectural requirements. The wattage densities are 17 (58 Btu) or 22 (75 Btu) watts per sq ft in any of the panel sizes.

The power consumption for the 4 x 4 ft size, 17 watts per sq ft unit, is 272 watts, and for the higher wattage panel, 352 watts. With 220-volt current, the 22-watt 4 x 4 panel carries 1.6 amp. The total current carried by any one circuit will not exceed 20 amp.

Each panel is ¼ in. thick, and is made up of layers of the following material: an exposed layer of plain cotton sheeting which anchors surface decoration, two insulating layers of phenolic resin impregnated cotton sheeting; conductive rubber impregnated cotton sheeting; insulating layer of phenolic resin impregnated cotton sheeting; backing layer of 3/16 in. asbestos board; backing layer of phenolic resin impregnated cotton sheeting and a heating insulating layer of aluminum foil, 0.001 in. thick.

A 2-in. non-conducting margin is provided on each panel for nailing the panels to ceiling joists. A standard nail covered with a polyethylene sleeve is used as precaution against grounding the nail to a steel or conducting member in the building when it is necessary to nail through the heating element. The standard method of connecting the panels is through an outlet box on the back of each panel within which the lead wires are connected to electrical binding posts contacting the rubber resistance layer. Panels are connected in groups of parallel circuits and about five circuits are required for the normal size building.

Although there are no wires in the heated area of the panel, wires are used to bring the electric current from the junction box or terminal to the edge of the rubber layer.

It is possible to use both 17 and 22-watt density panels in one room. The 22-watt units are placed near windows to offset large heat losses, and in bathrooms, which are usually kept warmer than other rooms. Best results are obtained by having the Uskon panels cover about 70% of the ceiling area by placing the panels in a peripheral pattern with a non-heating or dead section in the center. This dead area is filled in with standard building board. It is claimed that the non-heated section produces a slight air circulation to disperse tobacco smoke and kitchen odors.

The panels, which operate on 220 volts, provide a ceiling surface temperature of about 100F. Without thermostatic control, the makers claim the surface temperature will not exceed 120F. Each room has its own thermostat so that each room is heated to meet individual conditions. The ceiling heats up to maximum temperature in about 15 minutes.

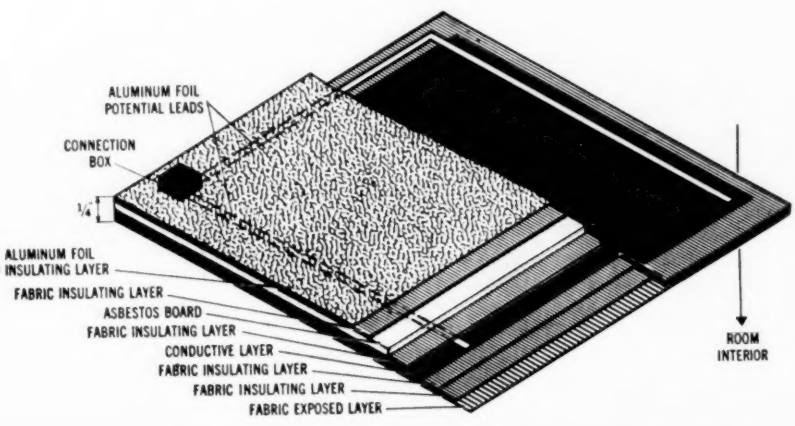
A house provided with these panels was designed and erected in Knoxville, Tenn., by the Fonde Construction Co., Knoxville. Power rates in this area are lower than in most sections of the country. The house has gone through a complete heating season, and when the power consumption for a particular month is studied in connection with the degree days for that period, the data provides an interesting picture of operation.

This house of 6384 cu ft content consists of a living room, one bedroom, kitchen, hall, bath and an enclosed sun porch. Forty-six heating panels were used—26 of this number are the 4 by 4 ft size and the balance are 3 by 4 ft and 2 by 4 ft. Five circuits were used, one for each room.

The house is insulated with 8-in. rock wool in the ceiling. Sidewalls consist of cinder blocks filled with Vermiculite and furred on the inside with sheetrock. Although doors are weatherstripped, the house does not have a storm door. Windows are steel casement without weatherstrip or storm windows. About 22% of the outside walls consists of glass. The floor is 4 in. Vermiculite slab on fill with a concrete top finish. The house has a calculated heat loss of 23,400 Btu per hr based on a design temperature of 0F.

For one year's operation from January 24, 1947 to January 24, 1948, 9,766 kwh were used exclusive of that used for heating domestic water and the cost was $53.79. This was for a heating season of 3,921 degree days. Based on a normal season of 3,700 degree days, the cost would have been $50.90.

Panels are made by U. S. Rubber Co.



Details of the laminated construction and panel

Performance of a Coal-fired Boiler Converted to Oil

RICHARD S. DILL and PAUL R. ACHENBACH
National Bureau of Standards, Washington, D. C.

As part of the research program on heating plants for small homes being conducted at the National Bureau of Standards in collaboration with the National Housing Agency and its technical staff, the performance characteristics of cast-iron boilers, both coal- and oil-fired, have been investigated. This report discusses the performance of a cast-iron boiler designed for coal firing after it has been converted to the use of oil by means of a gun-type burner. It is shown that a refractory firebox of low heat capacity and low thermal conductivity increases the efficiency of the converted boiler several percent, and that baffles which effectively direct the hot combustion gases over the heat-transfer surface can increase the capacity of the boiler up to 27%.

IN general, either the gun-type or the rotary-type oil burner can be installed in a conventional coal-fired boiler or furnace to convert it to the use of oil fuel. A larger combustion chamber is usually essential for burning solid fuel to permit complete combustion of volatile gases, and larger flue-gas passages are usually provided, chiefly to allow for partial obstruction of the passages by soot and fly ash. A smaller combustion chamber and less excess air are needed for burning oil than for the combustion of coal and result in higher efficiencies than are usually obtained with a coal-fired boiler.

Refractory material in a firebox converted to oil not only protects metal parts from intense flame heat but also improves combustion and increases the transfer of heat by radiation from hot refractory to the heating surface of the boiler.

Refractory of low heat capacity and low conductivity will heat more rapidly from a cold start and maintain higher temperatures during steady operation of the oil burner than will firebrick. The resulting higher firebox temperature improves combustion of the fuel and increases heat transfer by radiation to the crown sheet. Moreover, less heat will be lost by conduction through the bottom and sides of the chamber when the conductance of the refractory is low.

Metal or refractory ceramic baffle plates are frequently installed in converted boilers to direct the hot combustion gases more effectively over the heat-transfer surface. When a gun-type oil burner is installed in the front of a boiler which has flue passages at the rear, there is a tendency for the hot gases to pass to the rear of the combustion chamber and upward to the outlet without having brushed over the front part of the crown sheet. By attaching a baffle extending from the rear wall of the boiler halfway to the front, the hot gases are deflected forward and brought in contact with the entire crown sheet.

Some coal-burning boilers have more than one set of uptake flues and more cross-sectional flue area than oil-burning boilers require. If the flues nearer the front of the boiler are closed and a baffle plate installed, all of the gases will be directed over the greater area of heating surface to the flue at the rear.

Economizers, which usually consist of additional water-backed heating surfaces located in the combus-

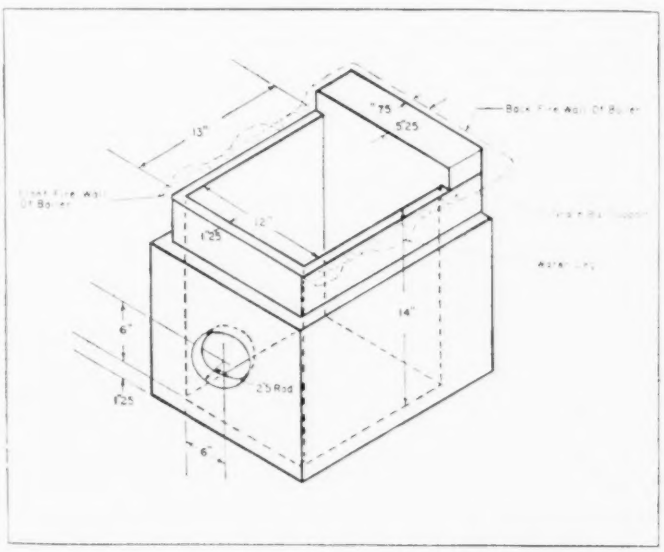


Fig. 1. Firebrick combustion chamber, made of standard 2½- by 4½- by 9½-in. firebrick. The space between the firebrick and the water legs of the boiler were filled with a mixture of magnesia and Portland cement.

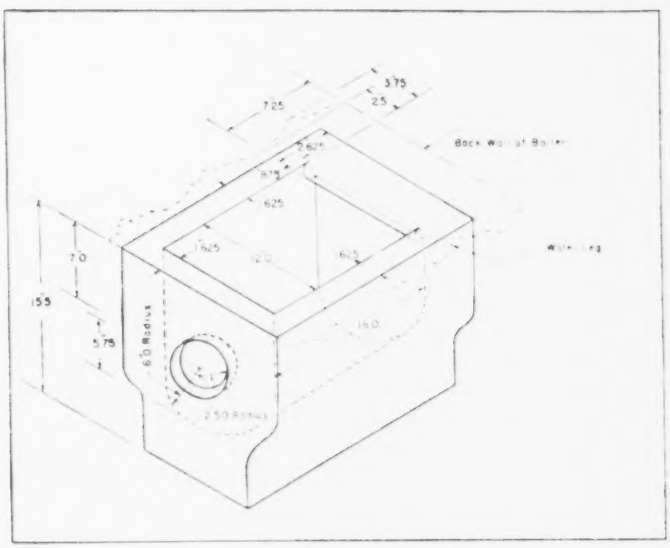


Fig. 2. Precast combustion chamber consisting of eight pieces of refractory fitted together. The space between the refractory and water legs of the boiler was filled with an insulating cement.

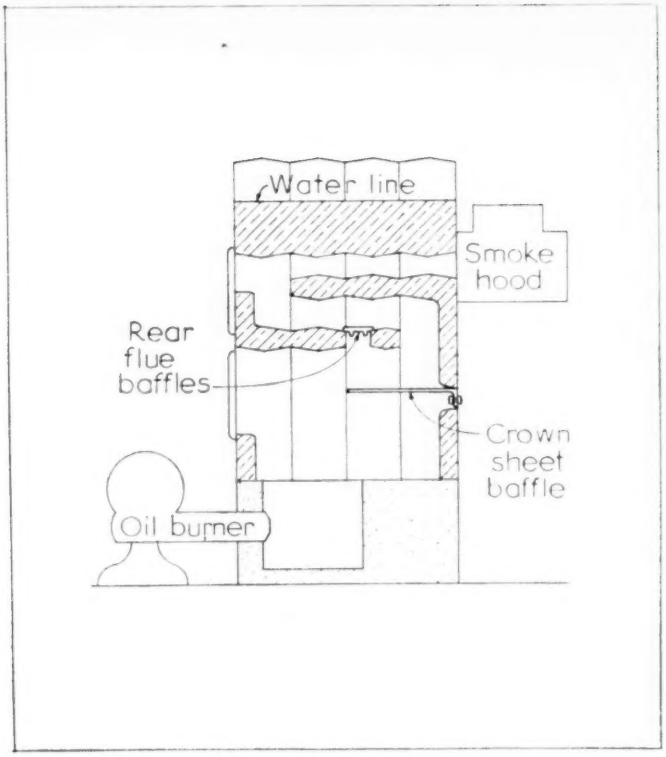


Fig. 3. Diagram, not drawn to scale, showing position of baffles.

tion space or gas passages, are also used to improve the efficiency and capacity of boilers converted to oil. They were not studied at this time as this investigation compared only the results of the use of two combustion chambers of different material and of somewhat different form. The effects of the installation of baffles and of the sealing of the clinker and firebox doors to prevent leakage were also investigated. Arthur H. Senner has reported the effect of the installation of two kinds of baffles and four kinds of economizers in round converted cast-iron boilers in A Study of the Oil Burner as Applied to Domestic Heating, U. S. Department of Agriculture *Technical Bulletin No. 109.*

Test Equipment

The boiler used for the tests was a stock rectangular cast-iron boiler with four vertical sections enclosed in a jacket. It had 34.5 sq ft of heating surface and a grate area of 3 sq ft. There were two sets of uptake flues at the rear of the boiler—one set between the third and fourth sections and a smaller set between the second and third sections.

The oil burner was a stock model of the pressure-atomizing, mechanical-draft type with a capacity ranging from one to two gallons of oil per hour.

A combustion chamber of standard firebrick was first used in the boiler. The space between the firebrick and the sides of the ashpit was filled with an insulating material. The chamber extended upward to a point 2 in. above the bottom of the water legs. Fig. 1 shows the dimensions of the firebrick chamber and its location in relation to the sides of the ashpit.

The precast combustion chamber was of the type recommended by the boiler manufacturer. From the rounded bottom, the sidewalls extended vertically upward to a point 2 in. above the bottom of the water legs of the boiler. Fig. 2 shows the size and shape of the precast chamber and its position in the ashpit.

The volume of the firebrick combustion chamber was 1.26 cu ft and of the precast chamber 1.30 cu ft, exclusive of the space from the top of the chamber to the crown sheet of the boiler, which was the same in both cases. The two chambers were located similarly with respect to the water legs and to the front and back sections of the boiler. Therefore, the differences in size and location of the two chambers was negligible.

The crown-sheet baffle was a cast-iron plate, ½ in. thick, bolted to the back of the boiler through one of the holes normally used for the domestic hot-water heating coil. This plate extended forward in a horizontal plane for a distance of 12 in. from the back of the boiler. It was as wide as the interior width of the boiler. A diagrammatic cross-section of a cast-iron boiler illustrating the application of the crown-sheet baffle is shown in Fig. 3. Baffles used in the forward uptake flues are also illustrated in Fig. 3.

Condensate was weighed; drafts in firebox and smokepipe were measured; and water level was maintained at a constant height. Temperatures were determined with thermocouples and the flue gases were analyzed with an Orsat apparatus. The full consumption was measured by weight using a platform scale.

Procedure

In order to permit ready comparison of the capacity and efficiency of the converted boiler with the different combustion chambers and baffles, a set of fixed conditions was substantially reproduced during the first test after each modification of the boiler. These conditions were established during a preliminary heating period by adjusting the rate of fuel supply, the draft, and the air openings into the burner to produce a stack temperature of approximately 600F, a concentration of 10% carbon dioxide in the flue gas, and a draft of 0.02 in. w.g. in the firebox. The heat imparted to the water under these specified conditions is called the "gross rated output" or, more briefly, the "capacity" of the boiler, measured in Btu per hour.

The output of the boiler under each of the test conditions was computed by means of the following formula:

$$Q = W\ (h_{fg} + h_f - h_i)$$

in which

h_{fg} = heat of vaporization of water at the measured steam temperature

h_f = heat of the liquid of water at the steam temperature, F

h_i = heat of the liquid of water at the feed water temperature, F

W = water rate, lb per hr determined by weighing the condensate

Q = output, Btu per hour.

By definition, the heat input to the boiler is the

product of the weight of oil burned per hour and the heating value of the oil. The direct efficiency is the ratio of the output to the input. The input which results in producing the gross rated output of heat will be called normal.

When the normal input had been determined, three sets of observations were made with fuel inputs of approximately 80, 100, and 120% of normal, but with the same firebox draft and with flue gases of the same composition.

The manufacturer of the oil burner recommended a No. 3 fuel oil for use in the boiler under test. Two No. 3 fuel oils with specific gravities of 0.863 and 0.871 and total heating values of 19,400 and 19,300 Btu per lb, respectively, were used.

Test Results on Combustion Chambers

The results of the tests of the boiler equipped with the precast combustion chamber and with the firebrick combustion chamber without baffles, are plotted in Fig. 4. It will be noted in this figure that the gross rated output of the boiler, at a stack temperature of 600F and 10% carbon dioxide in the flue gases, was 115,000 Btu per hr with precast chamber and 112,000 Btu per hr with the firebrick chamber; whereas, the

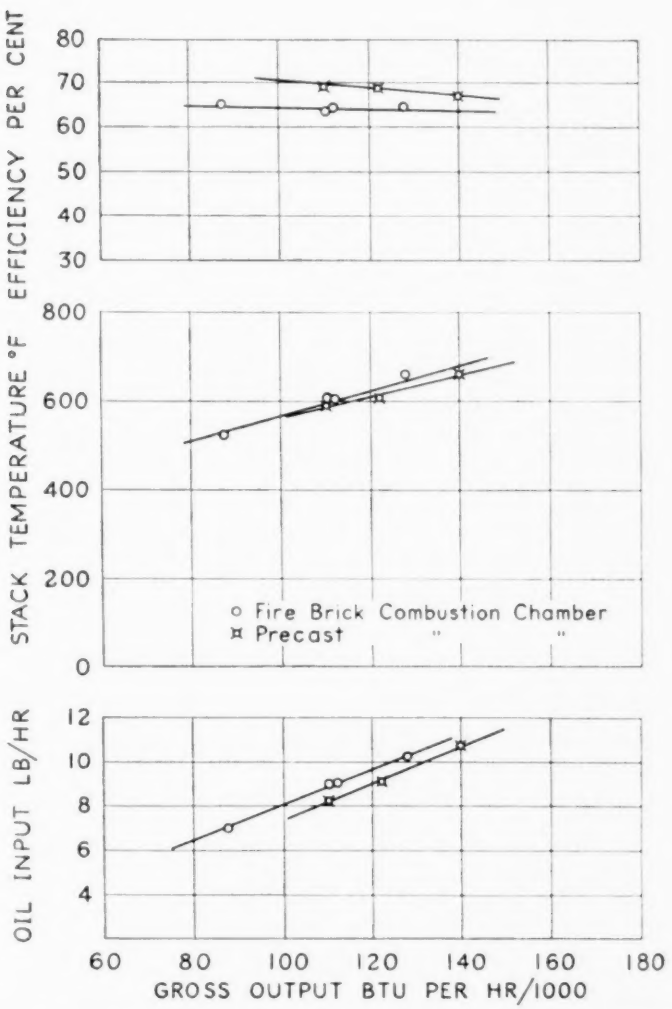


Fig. 4. Comparison of performance of the boiler when using firebrick chamber and when using precast chamber, both without baffles.

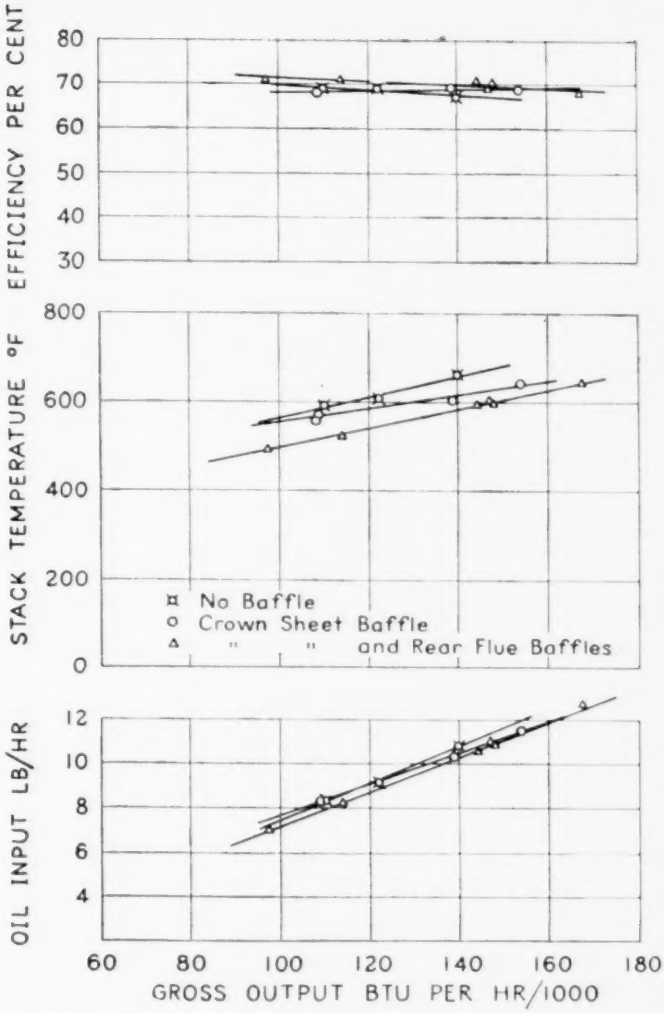


Fig. 5. Effect of using the crown sheet baffle alone and in conjunction with the rear flue baffles in a boiler equipped with precast combustion chamber.

efficiency of the boiler was nearly 5% greater with the precast chamber.

For a gross output of 115,000 Btu per hr, Fig. 4 shows that the boiler efficiency was about 64.2% with the firebrick combustion chamber and 69.0% with the precast combustion chamber. The oil consumption rate was 9.26 lb per hr in the former case and 8.67 lb per hr in the latter, representing a fuel saving of 6.3% when the precast chamber was used.

The precast chamber became visibly hotter than the firebrick combustion chamber during continuous operation. The former reached a medium cherry red color over its entire inside surface, while the latter did not glow visibly at any place during the course of the tests. This indicates that the flow of heat from the area of combustion through the refractory of the chamber was less for the precast material than for the firebrick. Evidently, the higher temperature of the precast chamber considerably increased the radiation of heat to the boiler since more heat was liberated in the combustion chamber in test 6 than in test 2, whereas, the flue-gas temperatures were practically identical during the two tests.

In general, the heat lost by radiation and incomplete combustion expressed in Btu per hour increased as the rate of fuel consumption increased. The sum

Table 1 – Summary of Boiler Performance for Five Test Conditions

[Carbon dioxide 10%, stack temperature 600F, firebox draft 0.02 in. w.g.]

Combustion chamber	Baffles	Gross rated output, Btu/hr	Efficiency, Percent	Oil input, lb/hr
Firebrick	None	112,000	64.3	9.05
Precast	None	115,000	69.1	8.72
Precast	Crown-sheet	128,500	68.8	9.70
Precast	Crown-sheet and rear-flue	146,000	69.5	10.78
Precast	Crown-sheet and rear-flue	152,000*	70.4	11.20

*Fire door, cleanout door, and clinker door sealed.

of these two losses was some 8,000 to 9,000 Btu per hr greater with the firebrick combustion chamber than with the precast combustion chamber at the same gross output.

Performance with Baffles

A comparison of the results obtained with and without the use of baffles shows that the use of the crown-sheet baffle alone increased the gross rated output of the boiler about 12%, but that it had no effect on the efficiency. The use of both the crown-sheet and the rear-flue baffles increased the gross rated output about 27% and increased the efficiency 1 or 2%. All of these tests were made with the precast combustion chamber installed in the boiler. Results of tests made with and without baffles are summarized in Fig. 5.

The curves in Fig. 5 indicate that, at some typical intermediate gross output such as 130,000 Btu per hr, the use of both baffles reduced the stack temperature from 635 to 565F, reduced the fuel consumption from 10.0 to 9.5 lb per hr, and increased the efficiency from 68.2 to 70.5%; for this gross output, the baffles effected a fuel saving of 5%.

Comparison of Fig. 4 and 5 shows performance of the boiler equipped with the precast combustion chamber and both baffles as against that of the same boiler equipped with the firebrick combustion chamber and no baffles. The gross rated output was increased from 112,000 to 146,000 Btu per hr or 30.3% by installation of the baffles and the precast combustion chamber. Again comparing the performance at 130,000 Btu per hr gross output, the curves show that the precast chamber and both baffles reduced the stack temperature from 655 to 565F, reduced the oil consumption rate 9.5% from 10.5 to 9.5 lb per hr, and increased the efficiency from 64.1 to 70.5%.

All of the tests previously discussed were conducted without sealing the fire door, the clinker door, and the cleanout door against leakage of air into the combustion chamber. Inasmuch as these doors are frequently sealed in oil-burning installations, tests were made to determine what effect this leakage had on the performance of the boiler. The indications are that sealing the doors did not alter the efficiency for the gross output of 120,000 Btu per hr and increased it only 1% for a gross output of 170,000 Btu per hr. Sealing the doors appreciably increased the gross rated output from 146,000 to 152,000 Btu per hr and the oil consumption was increased 0.42 lb per hr. Under the method of control used for the tests, sealing the doors would be expected to increase the primary air by an amount equal to the leakage at the doors which should increase the completeness of combustion. It should also prevent interference with the heat transfer by an envelope of relatively cool air leaking in around the hot combustion gases. Therefore, an increase in efficiency and heat transfer would be expected from sealing the doors.

The maximum efficiency of the combination boiler-burner unit occurred at a gross output of about 120,000 Btu per hr. However, the efficiency remained above 68% for the entire range of output from 75,000 to 200,000 Btu per hr. The lowest oil input of 5.6 lb per hr was obtained with a 1.00-gal per hr nozzle under a pressure of 105 lb per sq in. and the highest oil input of 15.5 lb per hr was obtained with a 2.00-gal per hr nozzle under pressure of 145 lb per sq in. Some soot was deposited on the heating surfaces at the lower firing rates when 1.00-gal per hr and 1.35-gal per hr nozzles were used, but at the higher firing rates no soot was visible on the heating surfaces at the end of the test.

Discussion and Conclusions

The results of this work are considered to establish the general possibility of improving the efficiency and of increasing the ratings or capacities of boilers after conversion from the use of coal to oil, by means of baffles in the flue passages and combustion chamber, by means of precast combustion chambers of special shape and low-density material, and by sealing the fire door to prevent leakage.

In addition to the use of baffles, boiler capacity can also be increased and the efficiency improved slightly by adding sections to a cast-iron boiler, thereby increasing the heating surface. The problem may arise as to whether it is more economical to attain an increase in boiler capacity by the use of baffles, by the installation of additional sections in a cast-iron boiler, or by the use of a new and larger boiler. It is anticipated that, of the three methods of increasing boiler capacity, the use of baffles will prove to be the best expedient, since no change in piping or other arrangements would be entailed. A summary of the results obtained in tests described is shown in Table 1.

Although all of the tests reported were made with the oil burner operating continuously, it is expected that the type of combustion chamber and baffles used would have similar effects on the efficiency and capacity of the boiler with intermittent operation. The precast combustion chamber should provide a greater improvement in efficiency for intermittent operation than for steady operation because it becomes hot more rapidly.

Sixteen Ways to Exhaust Welding Fumes

M. E. RINGQUIST
Mechanical Engineer
Deere & Co., Moline, Illinois

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M. E. RINGQUIST
Mechanical Engineer, Deere & Co., Moline, Illinois.

Ventilation engineers are still plagued by many problems in industry which have been solved only partially or for specific operations but, in general, are still perplexing when an ideal, all encompassing design is sought. Among these problems is a practical, economical, exhaust and ventilation system that will suffice for small as well as large assembly welding. This is a discussion of the variables involved, existing partial solutions, and an ultimate, over-all booth design.

PREPARATORY to the design of a local exhaust hood or the construction or design of a booth type welding fume exhaust system, it is imperative that the engineer study the problem from many angles. The following are the more important:

(1) *The size, shape and type of parts, assemblies or equipment to be welded.* From this data, it is possible to determine whether the welding can be done on a table where a local high velocity type hood can be used or whether a booth type exhaust will be made necessary by the large size of parts. In most cases, a local exhaust hood is designed where it is planned to weld only small parts and sub-assemblies on a table. Frequently, however, production requirements are boosted and each welder not only takes on more work but is required to handle a varied number of different pieces from small clip angles up to main frames for combines.

(2) *The manner in which the material is handled and how it is welded.* The limiting dimensions of a hood for table welding or those of a booth can be determined from the manner in which the material is handled and how it is welded. A hood should not be made to restrict the movements of a welder nor should a booth be designed in such a manner as to limit the welders operations around, over or under a large assembly to be welded in many spots.

(3) *The size and composition of the welding rod, the composition of the weld, the size of the weld and the materials to be fused together.* The volume, type and kind of air contaminants that may be expected can be roughly determined from the size of the welding rod, the kind of coating it may have on it, and the amount deposited on specific metals to be welded. There are many types of welding rods or electrodes. Some of these electrodes are for light weight metal, some for heavy metal, some for different types and grades of steel and still others to obtain more or less penetration into the material to be welded or to produce different properties of the materials joined at the weld point. Briefly, these electrodes fall into three classifications, namely: washed, semi-coated and heavily coated shielded-arc type. The washed electrode is merely a rod of more uniform arc characteristics than bare welding wire. The semi-coated type has a coating of an appreciable thickness containing a binder applied by dipping which partially controls the oxidation of the molten metal as it is deposited by forming a thin film of slag over the surface of the weld. Heavily coated rods use all the benefits of chemical coatings to control the fluidity of the metal, penetration of the weld, shape of bead, physical and metallurgical properties of the deposit.

During arc welding operations under all conditions, various combinations of toxic and non-toxic gases will be produced. There are certain to be oxides of the metals involved in the weld, oxides of nitrogen, fluorides from stainless steel and carbon monoxide from welding operations using the rods described above on various types of metals.

Roughly, the greatest amount of fumes will come from an arc welding operation where zinc coated stock is used or when using the largest diameter welding electrodes of the heavily coated type when the temperature of the weld is the highest. Although there have been exhaustive laboratory tests made to determine the actual amount of manganese oxide, silicon dioxide, nitrous oxide, etc., emitted from a single rod, all the actual conditions under which fumes and gases are produced in industrial practice have not been fully simulated because of the multiple combinations that can be experienced.

(4) *Whether the work is to be done on an hourly basis or a piece rate basis.* This item is especially important where a flexible tube exhausted high velocity hood is to be used. A welder who is working on a piece rate basis does not have time to move an exhaust hood from spot to spot as he welds. If that movement was considered when the time study man was at his side, he attempts to increase his production by elim-

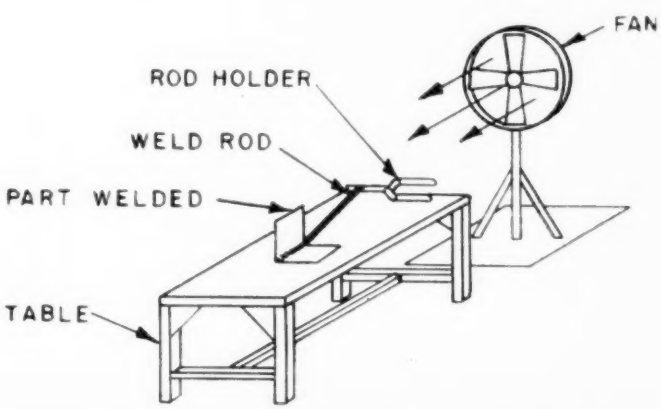


Fig. 1. Simplest "man-cooler" type of control.

inating that movement under normal working conditions. He not only will not move the hood but should not be expected to since that is assuming that he knows where the hood will function best.

(5) *How the parts or assemblies are delivered to the booths for welding and how they are taken away.* It is essential to know how the material is delivered to the booth since it will permit the engineer to design sliding curtains or doors into the booth for the greatest freedom of operation and yet utilize the least floor space per booth. This information will assist in establishing the maximum openings around the top and bottom of the drop curtains in the case of the canvas enclosed booth or the maximum openings in the case of the sliding doors or curtains when the fully enclosed booth is used. A minimum velocity of 125 fpm through the maximum opening should be maintained at all times.

(6) *The actual concentrations of various types of dusts and toxic gases present in the air.* Dust counts during welding operations are helpful since they indicate the largest size air-borne particles to be removed. If one considers the over-all fume concentra-

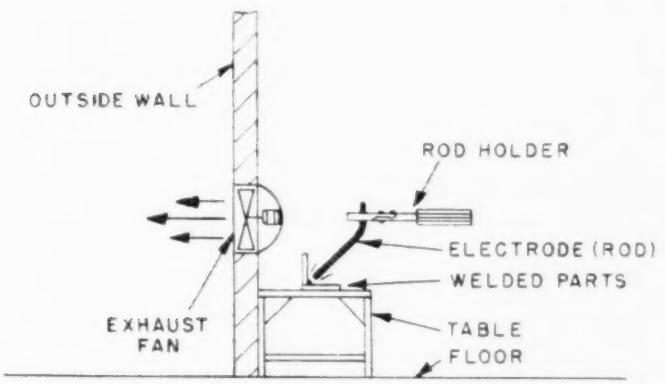


Fig. 2. Exhaust arrangement with fan in outside wall.

tion as a basis for exhaust, it is recommended that the over-all percentage be reduced below a limiting value of twenty milligrams per cubic meter. Of this figure there should not be more than 3 to 6 milligrams of manganese, .1 milligram of chromium, .15 milligram of lead, .1 milligram of cadmium and the rest could be a combination of other oxides and gases.

Since fume and gas removal does require large amount of air to be exhausted, many engineers are attempting to return vitiated air to the buildings with varying amounts of fresh air. In some instances, the air is being returned to the welding booths or areas. In many states, this practice is prohibited. If the fume and gas concentrations of the exhausted air were constant or if a maximum concentration could be established upon which to proportion the fresh air perhaps the recommended allowable concentrations could be held. There still remains the fact, however, that even though the exhausted air is filtered electrostatically, the toxic gases and gaseous odors are not removed, and though diluted by the additon of fresh air, the harmful irritants still remain along with the odors.

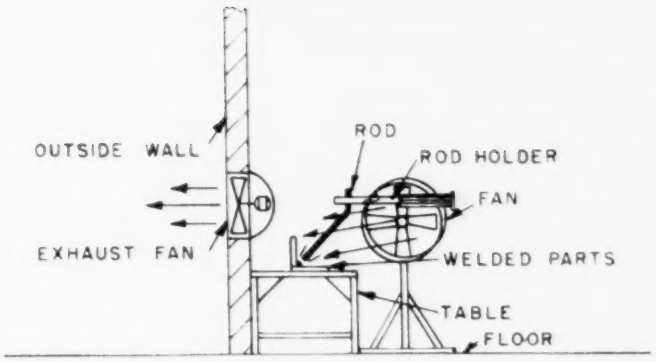


Fig. 3. Combination of systems shown in Fig. 1 and 2.

Of the many fume exhaust ideas that have been used during the writer's experience in this field, sixteen which have proved to have some merit in their own limited field will be described and discussed briefly. Each individual design of a booth or hood requires full engineering consideration if the proper amounts of air with adequate yet comfortable velocities are to be determined and the system is to be practical and economical. Most states indicate a volume of air in cubic feet of air per minute, per welder on the basis of the size of welding rod being used. In some instances these volumes are as low as 250 cfm for a 5/32-in. rod but a more liberal amount has been listed as 500 cfm for the same size rod. As a summary, these figures have been indicated for welding in confined spaces of 2000 cu ft or less.

Ventilation Rates per Welder

Steel Electrodes

5/32-in. or less	250 cfm
3/16-in.	400 cfm
1/4-in.	700 cfm
5/16-in.	1200 cfm
3/8-in.	1500 cfm

Alloy Electrodes (Fluoride Coated)

5/32-in. or less	250 cfm

Galvanized Plate

5/32-in.	1000 to 1500 cfm

A more liberal recommendation that would reduce the concentration to 15 milligrams per cubic meter suggests double the listed volumes.

In still other instances, there are recommendations of a certain velocity of air at a given distance from the source of the fumes. All of these recommendations are suitable in general but should be used mainly as a guide since each welding operation must be studied separately to determine the velocities and the amount of air to be exhausted.

The simplest type of control used is merely a fan of the man-cooler type as shown in Fig. 1 where the fumes are blown away from the welder as they are created. This of course is the least desirable type of system since it merely blows the fumes into the atmosphere either in the building or into the booth area itself. With this type of a setup, there is no need for calculations of volume of air and no selection of velocities. The maximum size fan, the volume of air and the maximum velocity that a specific welder

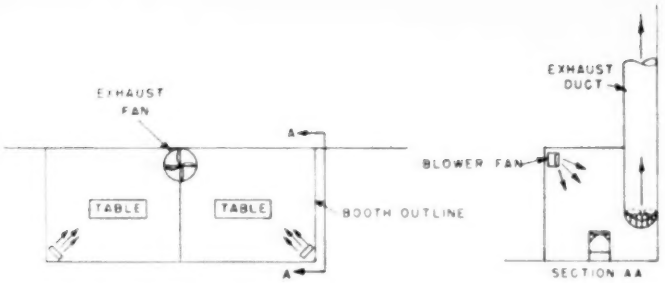


Fig. 4. One fan and exhaust duct common to two booths with small blower fans in each booth.

can stand as a physical being is the design of the system. If the air is too cool, there is too much air or too great a velocity, the welder merely adjusts the fan to a position to suit his fancy.

In Fig. 2, an exhaust type of setup is used and a fan is installed in an outside wall above a table for welding. The fan is set in the wall just above the table and most of the welding is done directly opposite the fan. The usual practice for this type of an installation is to calculate the required volume of the fan on a certain number of air changes for the encircling canvas curtained booth. This of course is an erroneous practice since the air will come mainly from overhead and be discharged out through the fan with a resultant number of air changes far less than the number calculated. In a recent installation of this type, the fan was installed in the middle window of three in the outside wall. The two steel sash on either side of the fan were of the operating type. The welders insisted on having the windows open because they said the exhaust was better. Actually, the fumes were being diluted with the fresh air being drawn in through the open windows.

Fig. 2 is an economical solution to the problem but is not adequate for all types of welding that can be done on the table or in the booth. The disadvantage of this arrangement is that the fan works very well as long as small parts are being welded near the fan, but when the same booth is used for welding larger assemblies the exhaust from the actual site of welding becomes nearly negligible.

In Fig. 3, a combination of systems shown in Fig. 1 and 2, over-all results are still no better than in either Fig. 1 or 2. The man-cooler fan has a tendency to disperse the fumes more rapidly than the exhaust fan can take the fumes away. The two fans are never the same size nor are they placed in such a relationship that the fumes blown by the man-cooler are picked up by the exhaust fan. It would matter little, however, if the fans were of the same capacity since the dispersion factor would still prevail. This combination of fans is economical, but it has similar disadvantages to those mentioned for Fig. 1 and 2 in addition to its own faults.

Of the three types of exhaust systems mentioned, only one seems to meet with the approval of the welders and that is the one shown in Fig. 2. The approval holds good only while table welding is being done. The reason they approve of course is obvious. The fumes are taken away from the welder. This is well to keep in mind on the following setups.

Fig. 4 shows an attempt to economize on the amount of air being exhausted and the horsepower involved by utilizing one exhaust fan common to two booths. In this case, two smaller fans considerably less in capacity are used to direct (actually disperse) the fumes toward the exhaust fan mounted in a vertical exhaust duct in a common corner of two adjoining booths. The bottom of the exhaust duct was set approximately four feet from the floor. This setting was also an erroneous decision since the welding fumes are warm and will not be cooled sufficiently by the directing fans to stay only four feet above the floor. The disadvantage of this combination was that, although it was calculated to move enough air from each of the welding booths to produce ten air changes, the fumes were being dispersed into the general atmosphere of the room. It was intended that the two small fans were to blow the fumes into the area of suction of the exhaust fan.

In addition, welders using the booth shown in Fig. 4 experienced colds continuously, stiff necks, stiff backs and shoulders from the direct blowing of the fans. In this instance, it was not possible to move the blower fans to a location to suit the fancy of the individual welder.

Fig. 5 represents the most effective, small-parts, table-welding, exhaust hood used in the past. This hood is still being used in almost all industries where small parts are being welded on a table in relatively close proximity to the hood. The hood need not be rectangular as shown. It may be elliptical or even circular as the occasion may demand.

The function of any hood is to create an area of air movement of such velocity at the fume source as to direct the gases and fumes into the face of the hood and thence through ductwork to a suitable discharging point. Obviously, therefore, if the velocity contours of a hood can be determined, the approximate performance of that hood can be determined.

The shapes of these velocity contours for any hood are purely functions of the shape of the hood. If the hood is round, for example, the contours of velocity when suction is applied take approximately the shape

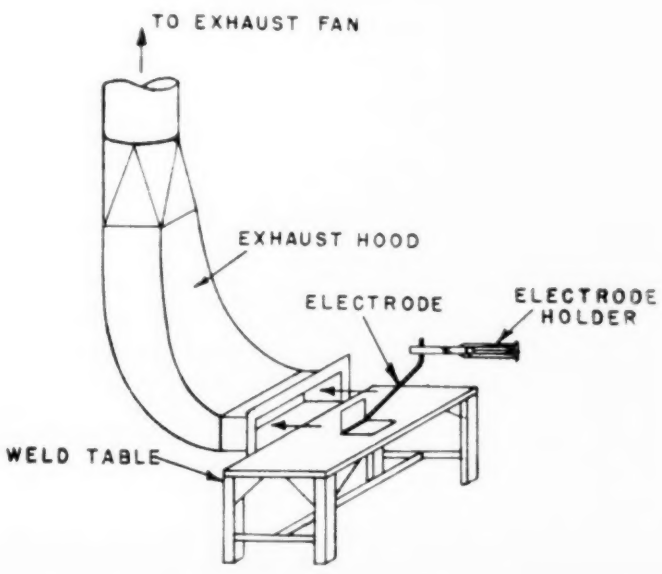


Fig. 5. An effective small parts welding table exhaust.

of a series of concentric imaginary spheres with the hood opening in the center.

Since all the air entering the hood, a quantity Q, must pass through the surface of each such sphere, of area A, the velocity, V, at each surface will be

$$V = Q/A$$

Also, since the area of a sphere is equal to $4\pi r^2$, where r is the radius, the velocity of air approaching the circular hood opening at a distance r from the opening will be

$$V = \frac{Q}{4\pi r^2} = .079\,\frac{Q}{r^2}$$

Thus, the velocity at any point will be directly proportional to the volume flowing and inversely proportional to the square of the distance from the opening.

These relationships have been discussed fully from time to time in the pages of past issues of this publication by noted authorities on this theoretical subject and therefore further reference here is superfluous.

The size, shape, amount of air to be exhausted, and the velocity are elements of each individual problem. As previously mentioned, the big disadvantage of this hood lies in the fact that it is sometimes used in connection with extensive welding on large frames and the location of the hood and the responsibility of placing the hood in the most advantageous position from the standpoint of effective exhaust is left to the ability of the welder.

A close grating in the top of a welding table as shown in Fig. 6 is another approach to trap the gaseous fumes from the welding operations before they have had the opportunity to be dispersed into the atmosphere of the shop or booth. The disadvantages of this type of an exhaust hood compared with that shown in Fig. 5 are numerous. First, the amount of air exhausted must be considerably more than in the case of the high velocity hood since the parts to be welded will be placed directly on the grating thus

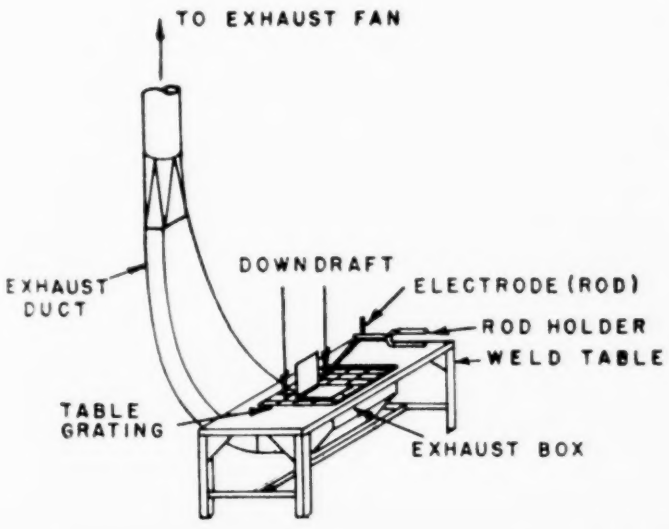


Fig. 6. Downdraft exhaust for a welding table.

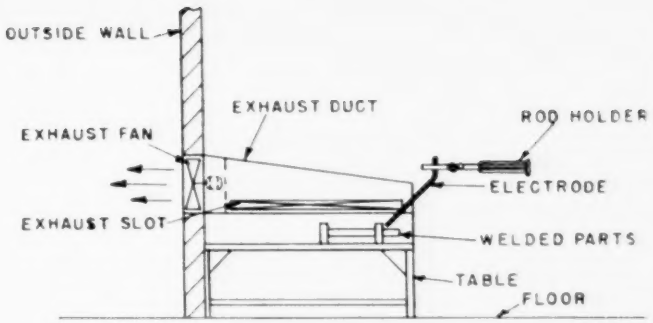


Fig. 7. Duct with side slot over back of welding table is exhausted to outside.

shutting off some of the area through which the air is to be exhausted. This adds some resistance to the system and also upsets the velocity contours above the grating. As a matter of fact the grating itself does exactly what those parts to be welded will do. As an example, suppose a 12-in. diameter duct were connected directly to the bottom of the table with no grating in it. The velocity 6 in. above the table at the centerline of the duct would approximate 26%. The velocity contour would approach that of half an elllipsoid placed above the table. If the grating were added, each individual opening would have a small amount of air passing through it and would tend to form its own velocity contour. The resultant contour shape would be much flatter due to the overlapping of individual contours. This situation would be further agravated when the parts to be welded were placed on the grating. Obviously an excessive volume of air must be provided to accomplish what was originally intended.

This type of hood has its physical disadvantages also inasmuch as the hood under the table becomes a catch-all for cigarette stubs, pieces of electrodes, etc. A cleanout door at the bottom of the hood can be provided but by so doing, one additional maintenance problem is added that could be avoided if that type of hood were not used.

An attempt to overcome some of the difficulties experienced with the type of exhaust used in Fig. 2 is shown in Fig. 7. As in Fig. 2, a fan is supported in an outside wall with either an automatic or a gravity type shutter on the discharge side. To this fan a duct is attached which tapers from the diameter of the fan ring to not less than 8 in. A partition in the center of the tapered duct and a slot the full length of the duct on each side about 12 in. above the welding table permit this installation to be used between two welding booths. This combination removes the fumes from the welding operations only if the welder does all his welding on the table and within close range of the slot. The slot, however, in this installation was not tapered as it should have been. As a result the velocity into the slot varied from the highest at or near the fan to negligible readings at the far end of the duct.

Considerably better results on small parts welding were obtained when this idea was revamped as shown in Fig. 8. Two welding tables, one in each booth, were put back to back. A sheet metal duct the length of the tables and about 12 in. deep was placed on end above the backs of the tables. The bottom of the duct of

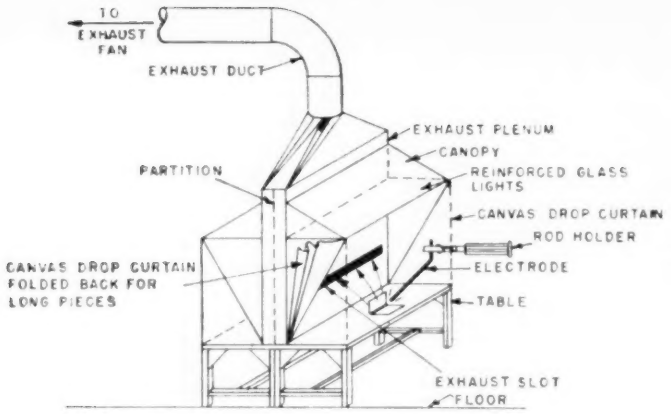


Fig. 8. An adaptation of over-bench slot arrangement with side curtains and canopy.

course was sealed to make a plenum. In this duct a partition the full length of the duct was installed to permit exhausting from both booths. This plenum was then connected to an exhaust fan by means of interconnecting ductwork with other booths with similar arrangement. About 24 in. above the welding table, a 4-in. wide slot was cut the full length of the duct on each side. Above this slot and about 78 in. above the floor was a horizontal glass canopy. This canopy extended from the side of the duct to the front of the table. Through this glass canopy incandescent light was provided for the welding operations. The glass was reinforced with wire, to withstand the constant bombardment of sparks and hot metal globules. The lights were then protected with a slanting cover or canopy. The lights were thus protected from dust and likewise the dust was not permitted to settle on the glass. Iron oxide fumes did discolor the glass however in time. At the ends of the canopy were some canvas drop curtains which extended to the table and could be thrown back at such time as long pieces or assemblies were placed on the table for welding. The velocity through the 4-in. slot was around 1000 fpm. On a 5-ft table, the slot would possibly extend to within 6 in. of each end. The total area of the slot therefore would be 1/3 of four or 1.33 sq ft. This would mean 1330 cfm from each booth or a total of 2660 cfm from each welding setup for each two-booth combination.

A special type of welding exhaust and welding setup is shown in Fig. 9. Four vertical partitions were set on a revolving table to divide that table into four quadrants. Above these partitions was a flat roof with canvas curtains between the roof and the partition to prevent leakage from one quadrant to the other. This type arrangement is used mainly for production welding where one man does the setup work in two quadrants on jigs or fixtures, the welder does the welding in the third and the products or assemblies are removed by the setup man in the last quadrant. In the center of the table is a vertical drum (duct) connected to an exhaust fan. In the side of the vertical drum, located in the position where the welding is being done is a vertical slot through which the fumes and gases are exhausted. This slot was about 4 in. wide and extended from just below the flat roof to just above the revolving table. The proportionate reduction in velocity from the top of the slot to the bottom is advantageous since the greater part of the fumes will rise to the top and be drawn off there. The velocity through this slot should not be less than 1000 fpm, but would have to be increased depending on the diameter of the revolving table. This particular installation required a table approximately 10 ft in diameter.

In spite of the fact that ventilating engineers have been warned repeatedly about not using the overhead canopy type hood for exhaust as shown in Fig. 10, they are still using them for welding exhaust as well as for smoke removal. The volume of air to be moved is usually figured incorrectly as a certain velocity across the entire area of the canopy times the area in square feet. For welding operations, it would be entirely unwise to use it without a fan in the exhaust stack. If the fan were omitted, there would be nothing to assist in getting the fumes away except the natural tendency of the fumes to rise. The fumes do not rise rapidly, however, and would tend to increase in concentration. In addition, the canopy type of hood is not recommended because it permits the fumes to rise past

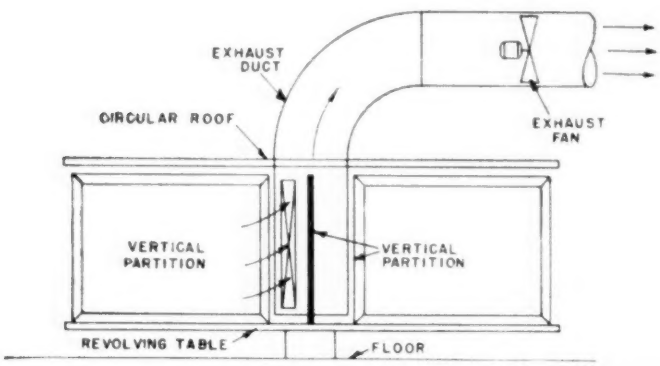


Fig. 9. Revolving welding table divided into quadrants for production welding.

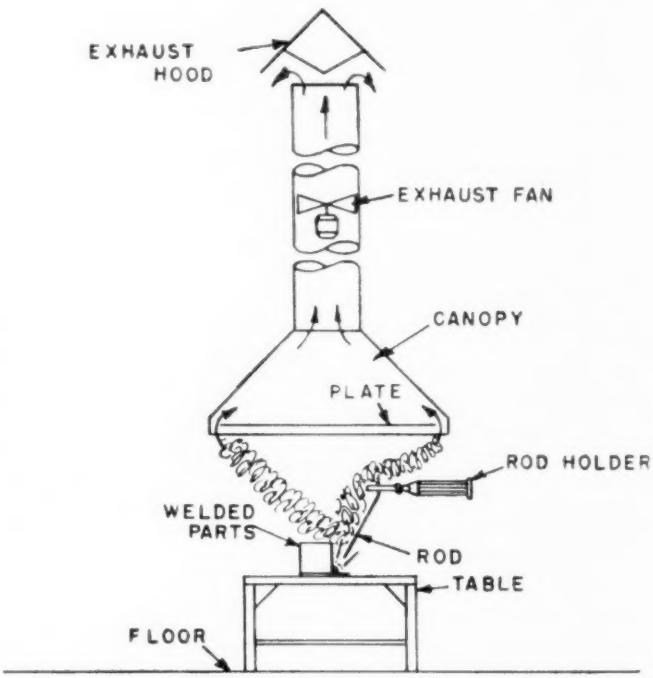


Fig. 10. Overhead canopy for welding exhaust.

the welders mask. This is definitely not advisable because it permits the welder to inhale as much gas as will pass through his mask. One variation of this type installation which is better adapted to ventilation of kitchen ranges or grilles than welding operations, is the same type of canopy with a large plate in the entry to the hood. This will leave a slot around the inside of the hood through which the fumes are exhausted.

This variation does have some tendency to pull the fumes from the welder providing the canopy is used inside of a curtained booth. It does reduce the amount of air to be exhausted since it reduces the area through which the air is exhausted. As an example, suppose the canopy were 10 ft wide and 12 ft long, which are not uncommon dimensions for a welding booth. This would require 10 by 12 by 150 fpm

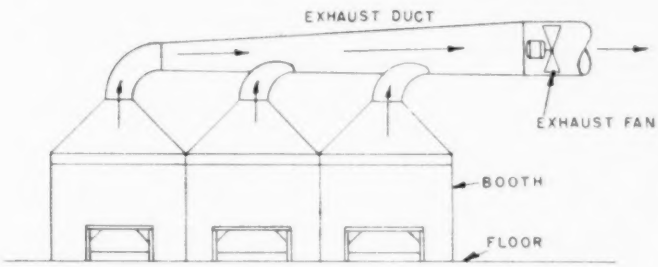


Fig. 11. Series of canopies exhausted to common duct.

or 18,000 cfm with a velocity of 150 fpm across the total area of the hood. If the plate were installed, a slot around the hood would reduce the area considerably. As an example, consider a 3-in. wide slot which would result in a total area of 10.75 sq ft times 150 fpm or 1612.5 cfm instead of 18,000 cfm. The velocity through the slot could be increased five times if desired and still there would be less than fifty percent as much air required.

A combination of these canopies or hoods connected by ductwork as in Fig. 11 is at the present time being used for welding exhaust. The welder is still permitted to breathe his fill of the fumes from welding operations since the gases rise past his mask. This arrangement is being used without the plates in the hoods and the booths are enclosed on three sides.

Another type of exhaust that is being used to combine small parts welding and large frame welding in the same booth is that shown in Fig. 12. As shown, a large area of the floor is fitted with a steel grating sufficient to support the welding machine, the welder and as many tote boxes or carts of material as delivered at one time to the booth. This grating must be supported underneath by steel beams to support this heavy load. Below the steel beams and attached to them is an exhaust plenum to which an exhaust duct is connected. The duct in turn is connected to an exhaust fan of the squirrel cage type as used for ventilating systems where considerable quantities of air are desired. A velocity of three hundred fpm at the welding table height of about 33 in. must be maintained when the total area of the grating is about 100 sq ft. This type of exhaust system was found to be fairly satisfactory

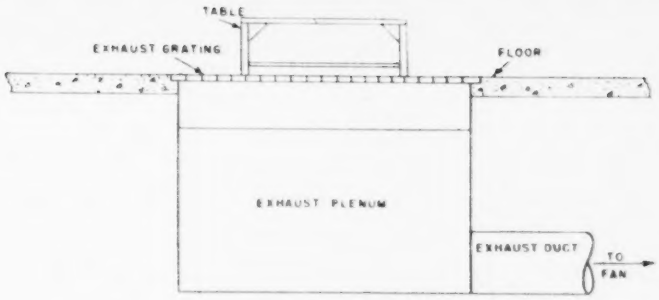


Fig. 12. Under-floor exhaust through large grating.

as far as removing fumes was concerned, but it took up valuable head room on the floor below or in some cases when there was no floor below, it was necessary to excavate to install the exhaust plenum. Further, the welder was not happy with the tremendous volume of air about him at all times. All stubs of welding rods were dropped into the exhaust duct along with empty cigarette packages, etc. In time this collection of paper and rods not only became a fire hazard but it necessitated cleaning at regular intervals to maintain the full benefit of the exhaust.

Diverting completely from the practice of catching the gases and fumes before they are dispersed into the air, other methods as shown in Fig. 13 and 14 have been tried. In Fig. 13, a portion of the building was curtained off with sheet metal. The tempered fresh air from the outside of the space was introduced under the welding table in a manner to blow the fumes immediately upward. The space inside the curtain was mechanically exhausted with a high volume fan to provide approximately twenty air changes to the space. In the case of Fig. 14, the whole building is treated as a curtained area. Tempered fresh air is introduced into the building to give good distribution and the building exhausted of large volumes of air. Either of these installations is costly since both must handle great volumes of tempered and exhausted air. Normal practice in calculating the heating load for an industrial building has been to allow one air change for infiltration. Anything above the one air change then is considered as superfluous. When ten to 20 air changes are involved the heating load becomes terrific. With this in mind it is well to give considerable thought to the design of any type of ventilating system.

As noted in the previously discussed systems, the disadvantages have been the lack of a combined system for large and small welding in the same booth or for the same hood. The costs have been high when the

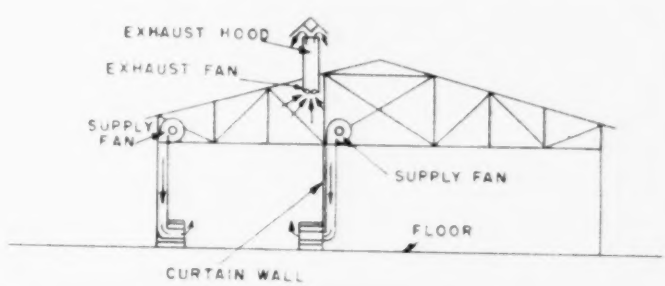


Fig. 13. Portion of building curtained off to provide welding space with very frequent air changes.

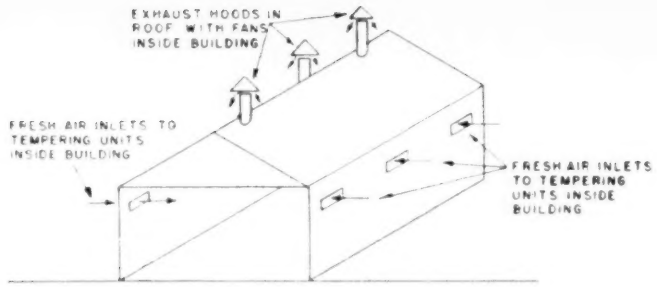

EXHAUST HOODS IN ROOF WITH FANS INSIDE BUILDING
FRESH AIR INLETS TO TEMPERING UNITS INSIDE BUILDING
FRESH AIR INLETS TO TEMPERING UNITS INSIDE BUILDING

Fig. 14. Whole building converted to exhaust chamber.

ultimate type of system was attempted and the results have not been too satisfactory. In addition, there have been complaints from the workers of drafts either on the floor on their feet or directly on the men causing physical ailments. Further, the complaints of inadequate exhaust have been fairly well justified since there are still some cases of metal fume fever, and cases of continuous colds due to lung and membrane irritation.

With the above in mind, new designs are being worked on to correct some of the existing difficulties. Fig. 15 illustrates a new arrangement which is now in operation and is seemingly satisfactory. There are some improvements already proposed that will no doubt better the results. The booth areas were first laid out so that a large rectangular duct with sliding slot grilles could be installed between two rows of booths. Then the area was enclosed down to within 8 ft of the floor with permanent curtains of corrugated sheet metal. The space between the duct and the ceiling and the duct and the floor was sealed and then sliding canvas curtains were hung on the other three sides of the booths. These curtains were hung to within six inches of the permanent curtains at the ceiling and to within a foot of the floor. The tables were set in each booth right up against the duct and the slotted grilles were high enough to be just above the table top. Here again it is necessary to maintain production flexibility so that material can be delivered into the booth on the front or on the sides. This necessitates that the booth curtains be of the sliding type rather than permanent. If the curtains were permanent, it would mean that the air entering the booth would all come through the front and thereby promote full exhaust across the cross-sectional area of the booth. The booths are figured for at least ten air changes per hour. The exhaust is provided by means of a squirrel cage type of ventilating fan. There is no tempered air being supplied to the space and as a result the tempered air must be taken from the building. This of course puts an extra load on the unit heaters on thermostatic control in this particular space.

For some 50 years, ventilating problems have been solved in much the same manner and since the development of the welding processes, the open type welding booth has been favored. In most instances, the open type was favored because of the possibility of dispersing some of the fumes as well as catching some before being dispersed. Furthermore, the health of the workmen has never been considered so thoroughly in the past as it is now being considered. The writer has long contented that if the type of exhaust has been altered why not alter the booths in an attempt to solve the drafts, the cold feet, the insufficient exhaust, the lack of facilities for large as well as small parts welding, and base it on the simple

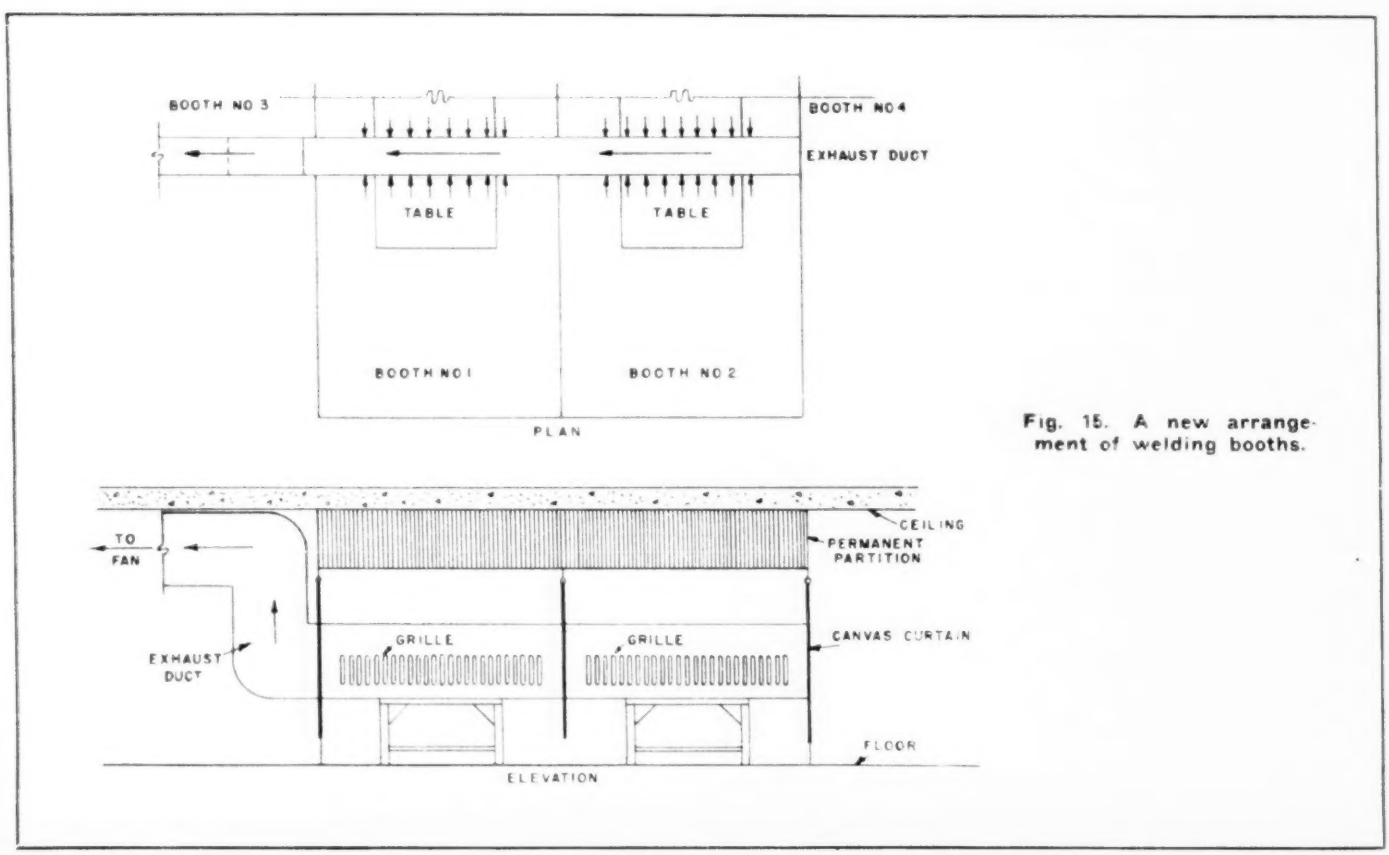


Fig. 15. A new arrangement of welding booths.

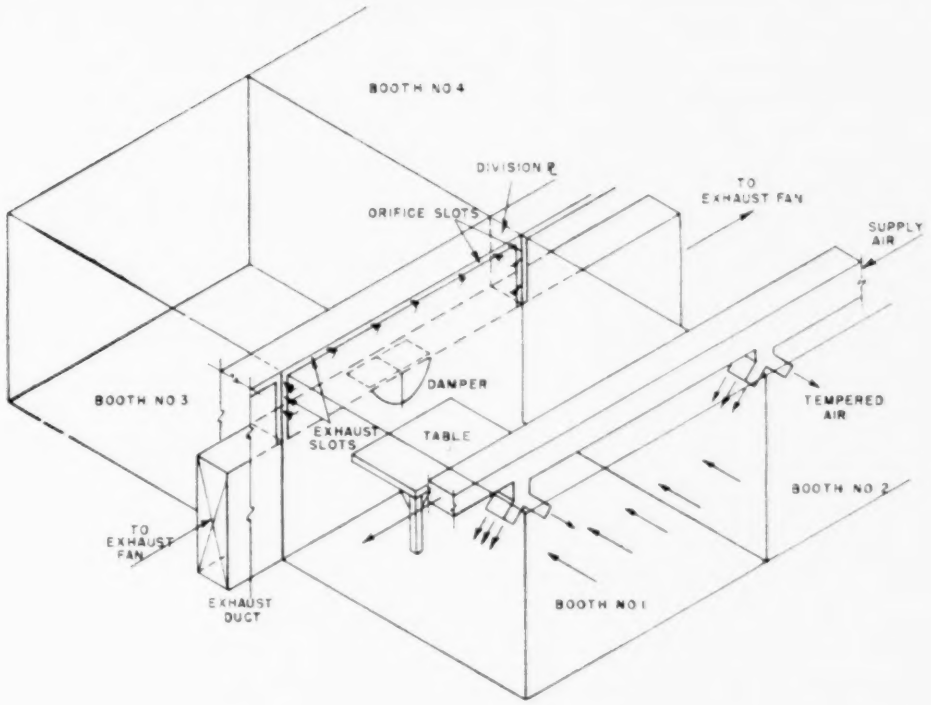


Fig. 16. Booth design suggested as basis for discussion.

fundamental of ventilation that if there is but one opening through which the tempered air can be introduced and the air is exhausted at the opposite side, surely the booth can be given a desired number of air changes much the same as a room. On this basis, the design as shown in Fig. 16 is presented for discussion. At least forty booths of this design with some variations of tempered air introduction are now under construction and within a year or less the results should be known.

These booths as designed by the writer are totally enclosed except for the front of the booth which has a sliding type canvas curtain. Artificial lighting is provided and the minimum velocity across the front of the booth without the canvas curtain in place is recommended as 125 fpm. The exhaust slots are at the back of each booth at the top and down the sides to about the height of a welding table. The height of the slots on the sides can be lessened if need be without seriously affecting the exhaust. This would permit lesser velocities in the exhaust duct which runs between the backs of the two rows of six booths each. The vertical sides of the duct serve as the back of the booth and contain the 3-in. wide slots through which exhaust takes place. Midway between the vertical slot plates is a partition extending from the roof of the hoods to within an inch or so of the damper in the duct provided for balancing the system.

On exhaust only this will mean that unless the welder has occasion to get behind his work, that is between the table and the slot plate, he will have exhaust away from him almost 75% of the time. With the canvas curtain tight or as nearly so as possible except for the room necessary to slide it, there will still be enough air filtering in at that point to keep the front top corner clear of fumes. Most of the infiltrating air into the booth will enter below the canvas curtain in the front of the booth. This movement of air from the bottom at the front to the top at the back of the booth will move with the natural tendency of the air filled with fumes to rise. They will be moving in the direction of the exhaust slots, however, and thus away from the welder's mask. With the velocity mentioned before, there will be approximately 160 cfm drawn through each booth. This air will have to be replaced and will add the equivalent of ten air changes per booth.

The writer recommends that tempered air be used to blanket the front of the booths as shown in Fig. 16 so that drafts within the building itself will be eliminated. The booths will be essentially an isolated setup insofar as exhaust and tempered air are concerned, and the air passing through the booth will be tempered air that is not blown on the man directly.

An actual installation of this type will be installed with the tempered air entering the building at the roof in a fairly well-distributed manner and the curtains in the front of the booths installed with more opening at the top of the curtain than has been recommended. Supply air is drawn through the heating coils of the steam distributing system and blown into the room through adjustable vane diffusers. Exhaust will be provided by means of squirrel cage ventilating fans (sirocco) and then exhausted directly to the outside. No attempt will be made to filter the air or to mix some of the exhausted air with fresh air and return it to the room.

As in the past, so in the future will there be ventilating problems arising, but all of them should be thoroughly treated as individual problems with the basic fundamentals of flow of fluids, design of hoods, and the physical well-being of the individuals in mind.

THE SALES ENGINEER

Get Into the Plant

BERNARD LESTER
Sales Engineering Consultant

HAVE you considered where business for heating and ventilating equipment from industry originates? Mostly in the plant, no matter who does the actual purchasing.

The formation of a valuable order usually starts in plant men's minds. It is motivated by desire to reduce costs, improve the product processed, or make employees more satisfied. Determination to buy a particular make of apparatus is based upon facts and impressions that form human opinion. They relate to the apparatus to be furnished, its application or suitability for the purpose intended, its cost, and a confidence in the ability of the seller to perform. Thus selling consists of reaching down to where the need exists, creating and developing the desire, then sketching a true picture of how it can be satisfied.

Go Where the Order Starts

What is more logical than to work where ideas form and grow? Yet how many sales engineers spend their time only at the desks of customer men in front offices? Few managers or purchasing agents will directly oppose the recommendations of those charged with operating the equipment bought. Time well spent with plant men yields business.

Someone in a plant making plastic products suggested that better results could be obtained by improved control over the air—its purity, temperature and humidity. The idea was there, but it lay dormant. A heating and ventilating sales engineer came along, got acquainted with the plant men, helped develop the idea and pointed the way to practical accomplishment.

Pretty soon a real order was in the making. It was stamped with the name of the sales engineer and his apparatus. He added reasons for the purchase and dramatized results. Management was finally persuaded to make the outlay. An order resulted—you might say created—by working with and through plant men.

Steps to the Order

This all sounds easy—but it wasn't. Let us trace the steps and the obstacles overcome. This will show what the sales engineer did to get this order, which at the start, was only an image in his mind.

1. The sales engineer called upon the purchasing agent of this plastic manufacturer. He was told they purchased fans and blowers infrequently and only for minor alterations. Nothing was needed now. Asking some technical questions regarding existing equipment, the sales engineer gained permission to see the plant superintendent.

2. The sales engineer focused his attention upon the manufacturing process and layout. Through friendly contact with the superintendent he discovered that difficulties were encountered from irregular temperatures, humidity variations, and dirt and dust in the air. Losses occurred in production, and the handling and storage of materials.

3. The sales engineer aroused a definite interest in not only correcting these troubles, but also in making the factory more inviting as a place in which to work. Finally, the plant men agreed to make a careful analysis of losses. The sales engineer suggested making tests and measurements to test dust contents in the air. He agreed to help in evaluating these test results.

4. By the time this investigation was complete, the sales engineer, working with a contractor developed a detailed layout covering an air conditioning system. The expense appeared to justify the proposed installation. The plant men became enthusiastic over the improvement, and the whole project was presented to the manager of the plant.

5. At this point competition appeared. A competing supplier jumped into the job and appealed to the manufacturer's management for a hearing. Fortunately this sales engineer had the support of the plant men. He fought their battle in selling the improvement to the management. He was careful to give credit to the plant men for their initiative and interest in production economy.

Seven Golden Rules

Such a course of action resulted in a substantial order for a complete air conditioning installation. This job of selling benefited the customer, the contractor and the sales engineer. Added to his list of helpful friends were the customer and the contractor. When the installation was complete and the sales en-

gineer had done a good job in following through, here was an excellent example for future selling reference.

Rules are sometimes broken. But here are seven golden rules invariably useful in selling apparatus to industrial purchasers.

First. Get into the shop. Meet shop men, and take an interest in their problems.

Second. Be informative and helpful. Shop men appreciate information that enables them to produce better results.

Third. Talk the shop man's language. Avoid highly technical terms. Never assume an attitude of superiority.

Fourth. Sell those features of your apparatus that appeal to shop men—men who use the apparatus.

Fifth. Support shop men, if right, in their recommendations to those higher up.

Sixth. Give credit to shop men for their interest and skill, when supporting their ideas and recommendations. Say a good word for them.

Seventh. Don't let interest and attention lag after the apparatus has been sold and installed. Be ready to jump in and analyze trouble, rectifying it yourself where possible. See that the equipment continues to work at its best.

Asking for the Order

L. E. ANDERSON
Pacific Steel Boiler Division, U. S. Radiator Corporation

The accompanying article by a sales engineer touches on a fundamental of selling. It appears here because of its wide application not only to sales engineers but to every engineer and contractor who sells equipment, installations or services – and all do.

MANY salesmen fail in the simplest part of their job—asking for the order. The great majority is hesitant on this point and, in fact, is positively timid, while some are almost apologetic. Other men are imbued with such a sense of confidence that the customer would not dare place the order elsewhere that they delay in asking for the order.

A salesman will work night and day to interview a prospect, go to no end of trouble to present his product in the most intelligent manner, spend many valuable hours of time calling upon the prospect, take him to satisfied users and then, when the prospect's mind is about made up, the salesman, fearing to get a "no", half-heartedly asks for the order or inquiries if he should come around tomorrow. This weakness has let many a sale go sailing out the door.

Unfortunately this failure is a fault few salesmen will admit. Due to the work they have done on the prospect they assume the order should automatically drop into their laps. Thus they labor under false impressions and feel greatly disappointed when the order is either not offered to them or lost to a competitor.

It is a fact that many a good man has been lost to an employer because the management failed to recognize this weakness or failed to educate the salesmen in the art of closing a sale. Yes, the salesman is armed with literature and sales manuals, he attends sales meetings, he hears pep talks; seldom, though, is it drummed into him *to ask and keep asking for the order.*

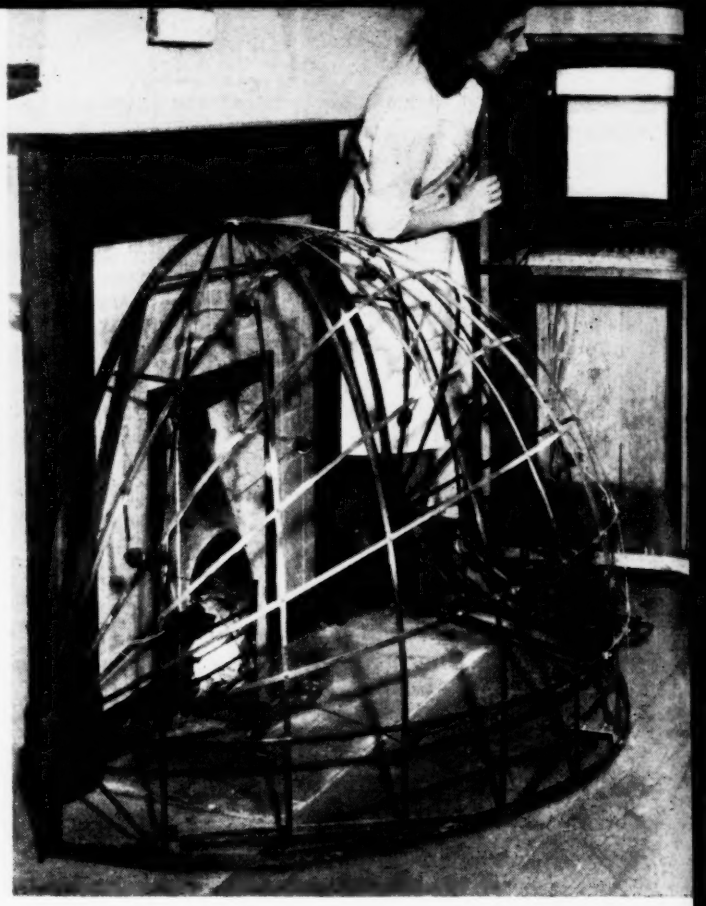
One excuse for not asking for an order is that the salesman thinks the time is not just right. By what magic measurement does he arrive at the "just right" time and, even if he has determined this mythical moment but hasn't found the order, what then? He is completely lost when a "no" comes, that it is a knockout blow and he folds up. However, if he asked for the order earlier and then received a refusal, he still has an opportunity to find the objection, work around and overcome it. The sure orders are few and far between and the salesman who lets an order wait may be due for a sad awakening.

The only way to be sure of an order is to get it, and usually the only way to get an order is to ask for it. To ask for an order may save a salesman many valuable hours, and many an otherwise lost order will be converted into a bona fide order. The salesman will soon learn that by asking for them he will actually get more orders. This will be the direct result of his asking, as he will find out that much sooner how sincere his prospect is. Also, any objection that would otherwise be hidden in the mind of the prospect would be given to the salesman and he could then handle it in a manner necessary finally to overcome such objection and obtain the order.

Many salesmen have the mistaken notion that they might offend the prospect in asking outright for the order. However, no offense can be taken by the buyer in being asked for the order because he expects it, and realizes that this is part of the salesman's job. In fact, a buyer will recognize the salesman who asks as being alert, and usually the buyer will come quickly to the point. When salesmen ask for orders and do so enthusiastically, they immediately strengthen the confidence the buyer has in them. Very often the buyer needs this urge, and to delay only drags the transaction along.

You can never ask for the order too soon—but you can ask too late.

Construction of this new tube mill in Decatur, Ala., was begun last year and is planned for completion this year by Wolverine Tube division of Calumet and Hecla, Detroit. Buildings will occupy a total of 368,300 sq ft on Wolverine's 264-acre site on the shore of the Tennessee River.



Bird-cage-like instrument measures heat thrown out by a new "Stand-In" fire developed at the British Coal Utilization Research Association laboratory. Fire being tested is a small built-in coke or coal burning stove designed for maximum heat from minimum fuel.

Picture Paragraphs

(Below) New Westinghouse compressor has daily cooling capacity of two tons of ice. Gag photo shows 300-lb unit with two tons of ice being demonstrated by D. E. Hallock, supervisor of air conditioning order service (second from right), to distributors who attended a conference at the Sturtevant plant in Hyde Park, Boston.

A worker at West Penn Power Co. prepares to shoot a specially made Osborn spiral nylon brush into one of a condenser's 5,681 tubes by means of a water gun carrying 200 lb pressure. This method claims substantial savings in condenser cleaning operation. Head of condenser has been removed for general overhauling.

DISTRIBUTION OF HEATING LOADS BY MONTHS

(Concluded from Reference Data Sheet 363-364)

PER CENT OF HEATING LOAD BY MONTHS IN NORMAL YEAR

State and City	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July
MONTANA												
Billings	1	2	7	13	17	19	15	13	7	4	2	..
Havre	1	3	7	12	16	18	16	13	8	4	2	..
Helena	1	4	9	12	16	17	15	13	6	5	2	..
Kalispell	1	4	8	12	15	17	14	12	8	5	3	1
Miles City	..	2	7	12	18	20	17	13	7	3	1	..
Missoula	1	4	8	13	16	17	14	12	8	4	2	1
NEBRASKA												
Lincoln	..	1	5	12	19	21	18	14	7	3	..	..
North Platte	..	2	6	13	18	20	16	13	8	3	1	..
Omaha	..	1	5	12	20	22	18	13	7	2	..	..
Valentine	..	2	7	12	18	19	16	13	8	4	1	..
NEVADA												
Reno	..	3	7	13	17	18	14	13	9	4	2	..
Tonopah	..	2	7	12	17	18	15	13	9	5	2	..
Winnemucca	..	3	8	13	17	18	14	12	8	5	2	..
NEW HAMPSHIRE												
Concord	1	3	7	11	16	18	16	14	9	4	1	..
NEW JERSEY												
Atlantic City	..	1	4	11	17	19	18	15	10	4	1	..
Cape May	..	1	4	11	17	19	18	15	10	4	1	..
Newark	..	1	5	12	18	20	18	14	8	3	1	..
Sandy Hook	..	1	5	11	17	19	18	15	9	4	1	..
Trenton	..	1	6	12	18	19	18	15	8	3	..	..
NEW MEXICO												
Albuquerque	..	1	6	14	20	21	16	13	7	2	..	..
Roswell	..	1	5	15	22	22	16	12	6	1	..	..
Sante Fe	..	2	7	13	18	18	14	13	9	5	1	..
NEW YORK												
Albany	..	2	6	11	17	19	18	15	8	3	1	..
Binghamton	1	2	7	11	17	18	17	14	8	4	1	..
Buffalo	..	2	6	11	16	18	17	14	10	5	1	..
Canton	1	3	6	11	16	19	17	14	8	4	1	..
Ithaca	1	2	7	11	16	18	17	14	9	4	1	..
New York	..	1	5	11	18	19	18	15	9	3	1	..
Oswego	..	2	6	11	16	18	17	14	9	5	2	..
Rochester	..	2	6	11	17	18	17	15	9	4	1	..
Syracuse	..	2	6	11	17	19	17	14	9	4	1	..
NORTH CAROLINA												
Asheville	..	1	7	14	17	19	17	14	8	3	..	..
Charlotte	..	1	4	13	21	22	19	13	6	1	..	..
Greensboro	..	1	6	13	20	20	18	13	7	2	..	..
Hatteras	..	..	2	11	19	22	21	16	8	1	..	..
Manteo	..	..	4	12	19	21	19	15	8	2	..	..
Raleigh	..	1	5	13	21	21	19	13	6	1	..	..
Wilmington	..	..	4	13	21	22	20	13	6	1	..	..
NORTH DAKOTA												
Bismarck	..	3	7	12	17	19	16	13	8	4	1	..
Devil's Lake	1	3	7	12	17	19	16	13	8	4	1	..
Grand Forks	1	3	7	12	17	19	16	13	7	4	1	..
Williston	1	3	7	12	17	19	16	13	7	4	1	..
OHIO												
Cincinnati	..	1	5	12	19	20	18	14	8	3	..	..
Cleveland	..	1	6	11	17	19	18	14	9	4	1	..
Columbus	..	1	6	12	19	20	17	14	8	3	..	..
Dayton	..	1	6	12	18	20	17	14	8	3	1	..
Toledo	..	2	6	11	17	19	17	14	9	4	1	..
OKLAHOMA												
Oklahoma City	..	1	3	13	22	23	19	13	5	1	..	..
OREGON												
Baker	1	4	8	12	16	17	14	12	8	6	2	..
Medford	..	2	7	14	18	18	14	12	8	5	2	..
Portland	1	2	7	12	17	18	14	12	8	6	2	1
Roseburg	1	3	7	12	17	17	13	12	9	6	2	1

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State and City	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July
PENNSYLVANIA												
Erie	..	2	6	11	16	18	17	15	9	5	1	..
Harrisburg	..	1	6	12	18	20	18	14	8	3	..	..
Pittsburgh	..	1	6	12	18	19	18	14	8	3	1	..
Philadelphia	..	1	5	12	18	20	19	15	8	2	..	..
Reading	..	1	6	12	18	20	18	14	8	3	..	..
Scranton	..	2	7	12	17	19	17	14	8	3	1	..
RHODE ISLAND												
Block Island	..	1	5	10	16	17	17	15	11	6	2	..
Providence	..	2	6	11	17	18	17	15	9	4	1	..
SOUTH CAROLINA												
Charleston	..	..	3	12	23	24	21	13	4	..	..	..
Columbia	..	2	4	13	21	23	19	12	5	1	..	..
Greenville	..	..	4	14	21	22	18	14	6	1	..	..
SOUTH DAKOTA												
Huron	..	2	6	12	18	20	17	13	8	3	1	..
Pierre	..	2	6	12	18	20	17	14	7	3	1	..
Rapid City	..	3	7	12	16	18	16	13	9	5	1	..
TENNESSEE												
Chattanooga	..	..	5	11	22	22	20	13	6	1	..	..
Knoxville	..	1	5	13	20	21	19	13	6	2	..	..
Memphis	..	..	4	12	22	23	20	13	5	1	..	..
Nashville	..	1	5	13	20	22	19	13	6	1	..	..
TEXAS												
Abilene	..	..	4	13	23	24	19	12	4	1	..	..
Amarillo	..	1	5	13	20	21	17	13	7	3	..	..
Austin	..	..	2	15	24	26	19	11	3	..	..	..
Brownsville	..	..	1	11	28	29	18	11	2	..	..	..
Dallas	..	..	3	13	25	25	18	11	4	1	..	..
El Paso	..	..	4	15	24	24	17	11	4	1	..	..
Fort Worth	..	..	3	12	24	25	19	11	5	1	..	..
Galveston	..	..	1	11	25	28	22	11	2	..	..	..
Houston	..	..	2	12	25	27	19	12	3	..	..	..
San Antonio	..	..	2	12	25	27	20	11	3	..	..	..
UTAH												
Modena	..	3	8	13	18	18	14	12	9	5	..	..
Salt Lake City	..	2	7	13	19	19	15	13	8	4	..	..
VERMONT												
Burlington	1	3	7	11	16	18	17	13	9	4	1	..
Northfield	1	3	7	11	16	17	16	12	9	5	2	1
VIRGINIA												
Cape Henry	..	..	4	11	19	20	20	15	8	3	..	..
Lynchburg	..	1	6	13	20	20	18	13	7	2	..	..
Norfolk	..	..	4	12	20	21	19	15	8	1	..	..
Richmond	..	1	5	11	20	21	19	14	7	2	..	..
Roanoke	..	1	6	13	20	21	18	12	7	2	..	..
Wytheville	..	2	7	13	18	19	16	13	8	3	1	..
WASHINGTON												
Seattle	2	4	8	12	15	16	14	13	7	5	3	1
Spokane	1	3	8	13	17	18	15	12	8	4	1	..
Tacoma	2	4	7	12	15	16	13	12	9	6	3	1
Walla Walla	..	2	6	13	19	20	16	12	7	4	1	..
Yakima	..	2	7	14	19	20	15	11	7	4	1	..
WEST VIRGINIA												
Elkins	..	2	7	13	17	18	16	13	9	4	1	..
Parkersburg	..	1	6	12	19	20	18	14	7	3	..	..
WISCONSIN												
Green Bay	..	2	6	11	17	19	17	14	9	4	1	..
La Crosse	..	2	6	12	18	20	18	13	7	3	1	..
Madison	..	2	6	12	17	20	17	14	8	3	1	..
Milwaukee	..	2	6	11	17	19	17	14	9	4	1	..
WYOMING												
Cheyenne	1	3	8	12	15	16	14	13	9	6	2	1
Lander	1	3	8	12	17	17	15	12	8	5	2	..
Sheridan	..	5	9	11	17	17	13	13	9	4	2	..

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The Conduit Weathermaster system for

Air Conditioning Multi-Story Buildings

W. L. McGRATH
Engineering Division, Carrier Corp., Syracuse, N. Y.

Third of a series of articles covering some of the methods employed for air conditioning multi-story buildings. The engineering and operating features of the Conduit Weathermaster system are described.

THE Conduit Weathermaster system has been designed expressly for the air conditioning of larger multi-room buildings. The approaching need for an air conditioning system to fit the specific requirements of this type of building was recognized back in 1930 and intensive development work was started. Today, there are more than 60 installations operating in office buildings, hotels, hospitals and apartment buildings.

The most important distinction between this system and older types of systems that have been used for this application, is the elimination of the large duct work required where the sensible cooling load is handled by cooled air, delivered from and to a remote apparatus. With this system, the sensible cooling function is separated from the dehumidifying and ventilating function.

Dehumidifying and ventilation are provided by a relatively small volume of air (20 to 25% of that required for sensible cooling) distributed at high velocity, through small, space conserving conduits.

Sensible cooling is done in the room by chilled water which is piped from a remote water cooler. Considering the cooling capacity of a 2 in. pipe as roughly equivalent to a duct, 24 by 56 in., the space saving involved can be readily visualized. No fans or other moving parts, are used in the room since the room unit induces room air over the cooling coils by the aspirating effect of the high velocity primary air.

System Components

Primary Air Equipment—A centrally located apparatus preconditions the primary air pumped to the Weathermaster units, see Fig. 1. The primary air has three functions: Ventilate; control relative humidity; provide the motivating force for circulating room air over the coil.

The primary air equipment employs functional elements similar to conventional systems, for cleaning, pre-heating, humidifying or dehumidifying, reheating and moving the air. Special fans are selected for operation at the higher static pressures.

Conduit System of Air Distribution—A system of small diameter, pressure tight, spiral-wound steel conduit, distributes the primary air at high velocity to the various Weathermaster units throughout the building. In the majority of applications, this primary air is 100% outside air.

Fans pump the primary air through special sound absorbers into round steel headers, which distribute the air to the periphery of the building. Take-off connections lead from these headers to the conduit risers located at the outside building columns. Conduit headers and risers are much smaller than conventional ductwork for two reasons: 1. Primary air quantity is only approximately 20% of the air circulated through a conventional low pressure system. 2. In view of this lower air quantity, considerably higher pressure drops may be tolerated without increasing fan horsepower, with the result that much higher air velocities can be used. Initial riser velocities run 3,000 to 4,000 fpm, and normal riser sizes range between 3 and 8 in. in diameter. Risers feed the Weathermaster units through small flexible run-outs, which allow for expansion and contraction, and facilitates installation.

Weathermaster Unit—This is an induction type unit, supplied with preconditioned primary air, which induces recirculated room air over a heating-cooling coil. Control of water flow through this coil, deter-

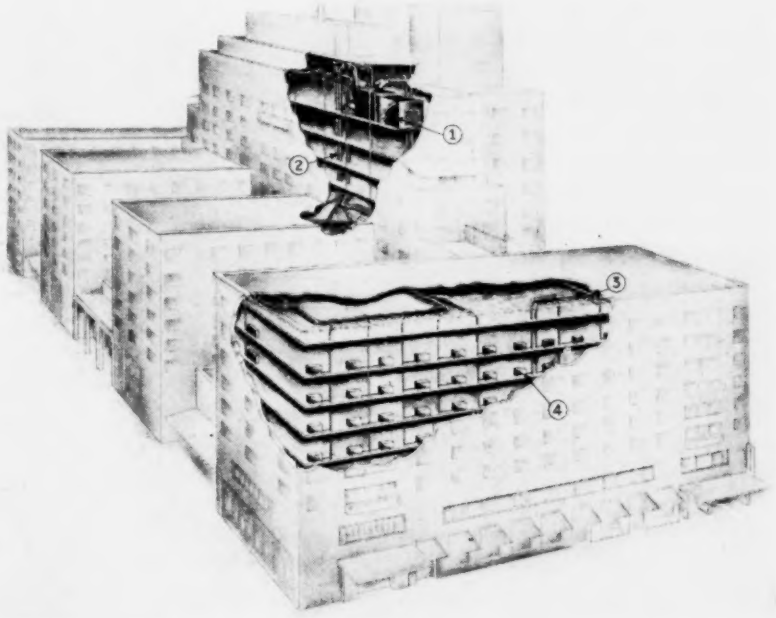


Fig. 1. Cutaway view showing typical primary air distribution system. 1. Air conditioning system. 2. Vertical conduit. 3. Conduit above ceilings. 4. Room Weathermaster unit.

mines the final room temperature. The unit is located in the room to be conditioned, usually beneath a window where the greatest heating or cooling load exists. Fig. 2 shows a typical application with cabinet and special baseboard to inclose water and air run-outs.

Primary air enters the units through a balancing damper, passes through a specially designed sound absorbing plenum chamber, and thence through the induction nozzles. These are set to operate at a specified pressure, usually between ½ and 2 in. w.g., and to noiselessly convert static pressure into a high velocity which effects the entrainment of room air through the Weathermaster coils. Functionally, the induction jets are equivalent to a fan so that room air is circulated through the coil without a fan or other moving parts, at a low noise level, and in a very compact space.

The coil, designed for low air velocity and resistance, employs extended surface, to provide heating in winter through circulation of warm water, and sensible cooling in summer with chilled water. Summer water temperatures are high enough and room dew-point low enough that condensation on the coil normally does not occur. However, an emergency drip pan and condensate line is furnished to take care of unusual circumstances.

Control of room temperature is accomplished by modulating the water flow to the coil, either by means of a manual valve or an automatic control valve, of the type which reverses its operation, depending upon whether cold or hot water is in use.

The mixture of primary and room air is discharged at normal velocities upwardly through a grille located either in the window stool or in the top of the standard factory-built cabinet. This grille is provided with adjustable deflectors, normally set to diffuse the air stream uniformly.

Water Piping System—A balanced reverse return, 2-pipe water distribution system is employed for supplying chilled or heated water to each unit. Chilled water for the distribution network flows first through the primary air dehumidifier coil to assure a water temperature in the room units higher than the primary dew-point. Water piping may or may not be zoned according to exposure, depending on design factors. However, whether there is a single zone for the building, or a separate zone for each exposure, each secondary piping network must be of the reverse return design to provide an inherent water pressure balance between units.

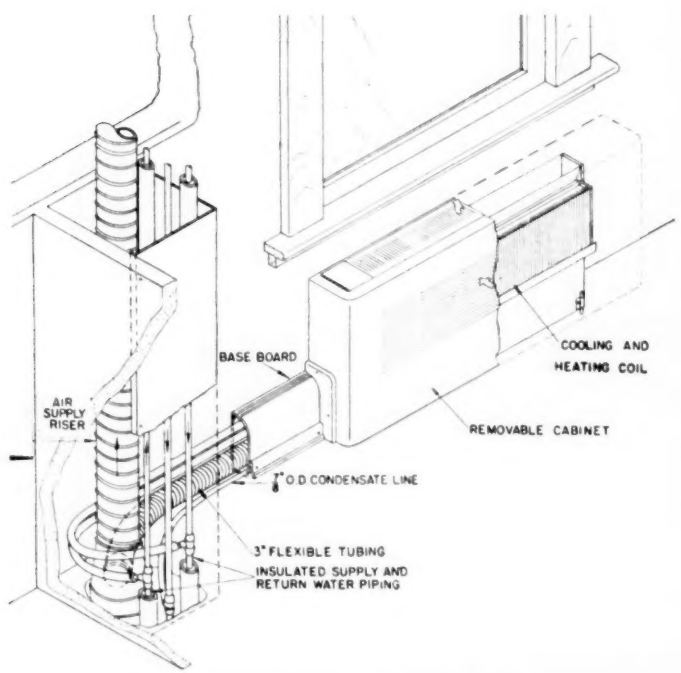


Fig. 2. Typical cabinet type installation.

Normally, all water piping is insulated. Risers and run-outs are copper pipe. Mains are of copper up to certain limiting sizes, beyond which welded steel or wrought iron is usually installed.

Refrigeration—Conventional methods of refrigeration are used to chill the water required for the units and for cooling and dehumidifying the primary air. Centrifugal refrigerating machines are usually employed for the medium or large size jobs, and reciprocating refrigeration for small jobs.

How System Operates

The cycle of operation for both summer and winter can be seen by reference to the system diagram, Fig. 3.

Summer Operation—Chilled water is pumped to the dehumidifier coil from the refrigeration machine and after leaving the dehumidifier coil is directed to the secondary water circuit. The temperature of the chilled water leaving the cooler is controlled by varying the capacity of the compressor. As the load drops off, due to a reduction in outside wet bulb, the dew-point leaving the dehumidifier will be depressed somewhat which is considered desirable under reduced load conditions.

Primary air temperature is always adjusted to offset changes in transmission loads on the building. Therefore, the temperature of the discharge air is scheduled proportionally to the change in outside temperature. The discharge thermostat is reset from outside temperature and will then control the reheater in order to maintain the required schedule.

Chilled water is circulated through the water cooler and dehumidifier coil by means of the chilled water pump. Water leaving the dehumidifier coil is picked up by the secondary system pump and directed to the room units. A thermostatic control on each unit regulates room temperatures by throttling the flow of cold water to the unit coil.

Winter Operation—For winter operation, the water in the secondary system is circulated through the water heater and is controlled to maintain the winter water temperature. Room control is of the reversing type, and changes from reverse to direct action when the water is changed from cold to hot.

For winter, the steam valve on the preheater is closed in order that cold primary air can be supplied at the same time that hot water is used on the secondary system. When the outside wet bulb drops to a point approximating the required design dew-point, the refrigeration apparatus can be shut off as all of the

cooling can normally be obtained from outside air. In order to prevent the winter dew-point from dropping too low, a preheater will warm the incoming air sufficiently to maintain the required apparatus dew-point.

Under some conditions, a low enough dew-point to prevent window sweating cannot be obtained without danger of freezing the sprays. Under such conditions, part of the sprays can be cut off to provide a lower dew-point.

Zone Control—Instead of controlling each room individually, it may be desirable to zone the secondary water system according to exposure and control water temperature by zones. In this case, additional secondary water pumps and water heaters may be used, depending on the number of zones required.

Zoning of the secondary water system is usually indicated where manual control rather than automatic control is used in each room, so that the entire burden of changing unit capacity with variable sun load does not fall on the occupant.

Advantages of System

Among the more important special points of how this system meets the needs for multi-room air conditioning are the following: Minimum space requirements; control of conditions throughout the year; draftless room air distribution; minimum fire nazard; positive ventilation; low maintenance and long equipment life; flexibility for tenant changes and partitioning.

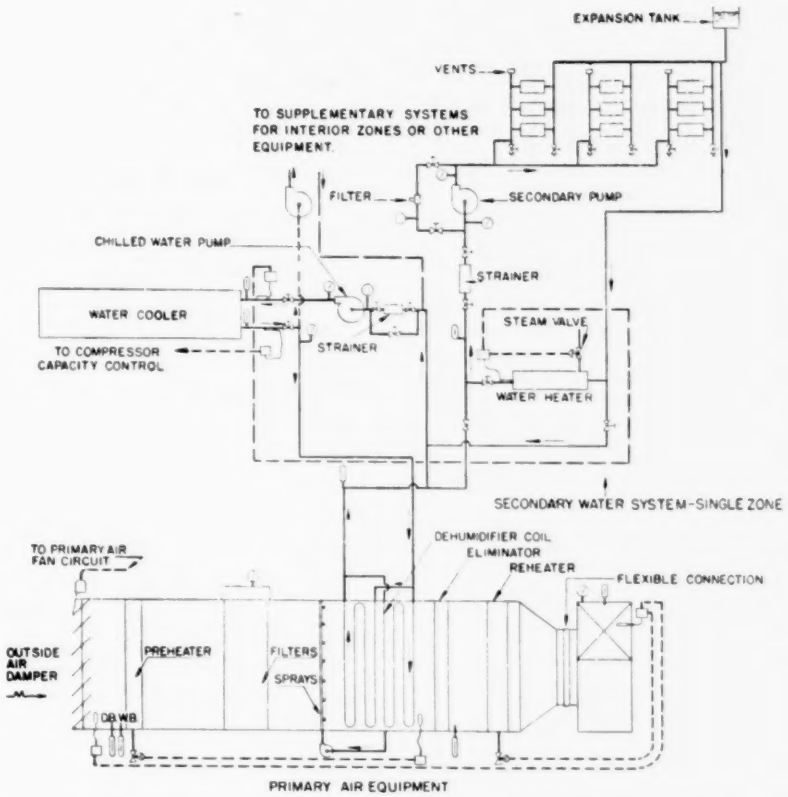


Fig. 3. Schematic diagram of a typical system arrangement.

Chromated Protein Films Inhibit Corrosion

Chromated protein coatings offering a convenient, inexpensive means of protecting metals especially zinc, iron, brass, and chromium, during outdoor storage in mildly corrosive atmospheres, have been developed by Abner Brenner, Grace Riddell, and Robert Seegmiller of the National Bureau of Standards. The protective value of such films is somewhat better than that afforded by chemical surface treatments and is much superior to that of corrosion-inhibited oils and waxes. The metallic surface to be coated is first dipped in casein, albumin, or gelatin. The resultant film is impregnated with chromate, which both hardens the film and inhibits corrosion.

The wartime scarcity of many non-ferrous metals led to the extensive substitution of ordinary carbon steel for copper, brass, aluminum, and stainless steel in both military and civilian uses. While the steel was generally protected with zinc coatings, the tendency of the zinc to form objectionable corrosion products brought about a widespread use of chromate films on the zinc. These films were formed on the surface by chemical attack in aqueous chromate solutions and, though only a few hundred-thousandths of an inch thick, were useful in inhibiting corrosion. However, as this was apparently due to the presence of minute amounts of soluble chromate, slowly liberated by the action of moisture, it seemed possible that an enhanced corrosion resistance might be obtained by applying a large quantity of chromate to the metal surface. Although initially developed at the Bureau as a substitute for chemical surface treatments of zinc, the chromated proteins are also of value in protecting aluminum, steel, brass, and other metals.

The principal constituents of the chromated protein films are a corrosion inhibitor for the metal, a protein which acts as a vehicle for the inhibitor, a hardening agent, and a bactericide to prevent putrefaction of the protein. The chromate always serves as the inhibitor and may act as the hardening agent and the bactericide as well. However, other materials such as formaldehyde, tannins, or certain salts of the heavy metals can be used as the hardening agent.

When freshly prepared and hardened, the films are almost insoluble in water and are so hard that they cannot be scratched with the finger nail. Exposure to light further hardens some films and renders them still less soluble. However, the films may be quickly removed from metal parts by application of an alkaline solution such as 5% sodium hydroxide. Their removal is easier and less hazardous than with oil films.

Joints for Thin Wall Tubes

J. E. YORK
Building Service Engineer, Stone & Webster Engineering Corp.

Descriptions of joints used for connecting thin wall tubes made of copper, brass, steel, Monel and other alloys. This is one of a group of articles on the methods of joining pipe.

STEEL, genuine wrought iron and brass piping with screwed or flanged fittings for many years provided the only satisfactory means for connecting equipment for transporting liquids and gases.

Modern developments of automotive, refrigeration and oil burning equipment, which required compact light weight installations made it necessary to provide piping which could be installed with a minimum number of fittings and joints in relatively inaccessible places and with considerable reduction in weight.

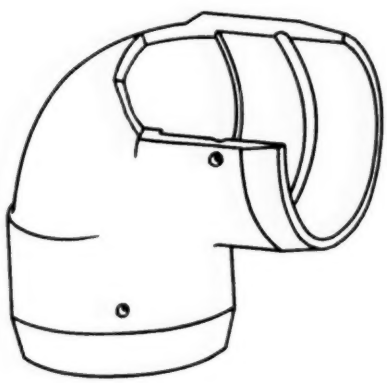


Fig. 1. Details of the sweated or soldered joint.

The necessity for installation or replacement of heating or plumbing piping in existing buildings and a desire for greater permanence without excessive cost led to the use of thin wall tubes. Thin wall brass tube using fine thread fittings was commonly used in this country by the plumbing industry for many years.

Copper water tube was commonly used in Great Britain and Europe for many years before it was introduced to this country for underground service lines about 25 years ago. It is now used extensively for all kinds of plumbing, heating, refrigeration and air conditioning work as well as for oil burner lines, and piping connections on automobile engines, Diesel units, turbines, pumps, pneumatic control systems, etc. Copper tube can be obtained in various weights and several types.

Type M is furnished in hard temper only for use with sweat fittings for general plumbing and heating purposes under normal water conditions. It is sold in 20-ft straight lengths only, in sizes $\frac{3}{8}$ to 4 in. This type of tube should not be used for refrigerant lines.

Type L is furnished in hard or soft temper, and is used for general plumbing purposes and for refrigeration lines with either flared or sweat fittings. The hard temper tube is recommended for refrigeration lines and for exposed lines where appearance or operating characteristics of the piping system require smooth unobstructed lines with minimum resistance to flow.

Type L is furnished in soft temper coils up to 60 ft for sizes $\frac{3}{8}$ to $1\frac{1}{4}$ in. and in soft temper straight 20-ft lengths for sizes over $1\frac{1}{4}$ to 2 in. dia. Hard temper straight 20-ft lengths are available in sizes $\frac{3}{8}$ to 6 in.

Type K is furnished in hard and soft temper. For underground water lines, soft temper tube is commonly used; for general plumbing purposes under severe water conditions both hard and soft temper tube is used.

Type K tube is available in 45-ft and 60-ft coils for sizes $\frac{3}{8}$ in. to $1\frac{1}{2}$ in. and in 20-ft straight lengths for sizes $\frac{3}{8}$ in. to 2 in.

Joints for Copper Tube

A wide variety of types of joints has been developed for use with tubes which do not have sufficient wall thickness for threading.

The following types of joints are shown and described in this article:

Sweated or soldered joints, compression joints, S.A.E. flare joints, inverted flare joint, Hi-duty joints, Flex joints, flexible hose couplings and Ermeto joints (steel fittings).

Sweated or Soldered Joints

This type joint, Fig. 1, is used with either type M or type L tube on installations of a permanent nature such as hot and cold water, waste and vent lines for plumbing systems, compressed air lines, heating lines, refrigerant piping, etc.

Where used on drainage systems, fittings are manufactured with a pitch of $\frac{1}{4}$ in. per ft to meet plumbing code requirements.

The fitting shown has a shoulder which fixes the distance the tube will slip into the opening. The shoulder height, which is approximately equal to the thickness of the tube wall, provides a smooth uninterrupted flow through the fitting and also serves as a solder dam. Holes are provided in the fittings connecting with a solder feed channel which runs completely around the joint to assure thorough, even distribution. The solder should always be fed through the hole, never from the outer edge of the joint. The solder then flows inwardly and outwardly, filling the channel and the broad bonding surface between the inside of the fitting and the outside of the tube.

The procedure to be followed in making a joint of this type is as follows:

(1) Cut off the copper tube squarely, using a fine tooth hacksaw, 32-tooth blade preferred. A square-end sawing vise may be used to in-

sure that the pipe is not cut off at an angle.

(2) Remove the burr from the end of the tube with a file or a scraper.

(3) Clean the outside of the tube over the distance it will slip into the end of the fitting, with medium No. 1 sandpaper or sandcloth.

(4) Clean the inside of the fitting in a similar manner.

(5) Carefully wipe the tube and fitting after sandpapering.

(6) Using a brush, apply solder flux to the outside of the cleaned portion of the tube and the inside of the fitting. Before applying the flux, make sure both parts are dry. In extremely cold weather, warm the fitting and tube with a torch to approximately room temperature (70 to 80F).

(7) Slip the tube into the fitting as far as it will go and twist it back and forth a few times to insure even distribution of the flux.

(8) Melt a drop of solder into the most convenient solder feed hole of the fitting. Apply heat around the fitting until the drop disappears. Capillary action carries the solder around through the channel and over the contacting surfaces indicating that the proper temperature has been reached. Feed solder through the hole only until it appears around the end of the connection, thus completing the joint. Always remove the flame when feeding the solder.

The first indication that the solder has bonded the two surfaces is the appearance of a ring of tiny dark green bubbles around the outer edge of the connection. This is the hot flux being forced out by the outward flow of the solder. When these bubbles are wiped off, a continuous bright ring of solder appears which is the visual assurance of a perfect connection.

After filling the hole, completely wipe off any surplus solder with a cloth and allow the joint to cool before placing any strain on it.

Compression Joints

A compression joint as made with Imperial fittings is shown in Fig. 2. This type of joint consists of cup shaped nuts, sleeves which taper to both sides, and a body which has square cut ends with slight belling on the inside.

When assembling, slip the nuts and sleeves over the tube, insert the tube into the body until it rests against the shoulder, then move the sleeve into position and tighten the nut.

This type of joint may be used with copper, brass, aluminum and thin wall tube such as Bundy. When used with Bundy or similar tube, the tube should be of a type having a special outside tinned coating. This extra tinning fills the seams of the tube, giving the fittings a tighter leakproof grip.

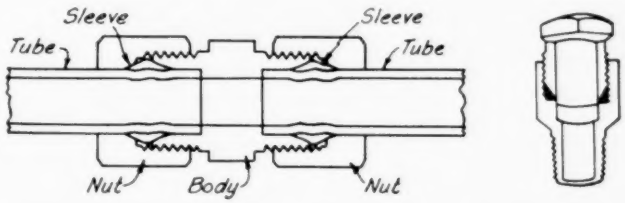


Fig. 2, left. Compression joint. Fig. 3, right. Double compression joint.

Common applications of this type of joint are for connecting gasoline, grease, oil, vacuum and air lines and other low and medium pressure services where excessive vibration or tube movement is not involved.

Its particular advantages are simplicity of installation, low cost and ease of assembly. No flaring, soldering or other preparation of the tubing is necessary for assembly. Compression fittings are ordinarily made for $\frac{1}{8}$ to $\frac{3}{4}$ in. O.D. tube.

A double compression fitting, Fig. 3, is manufactured by the Lincoln Brass Works Inc. There are only two parts to this fitting; the body and the compression screw. The manufacturers claim the double compression feature causes one seal at the tapered end of the compression screw and another against the V-shoulder in the body.

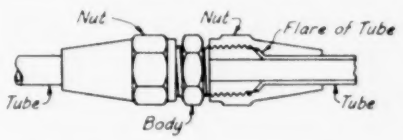


Fig. 4. S.A.E. flare joint with Imperial fittings.

When making up this type of joint, the following procedure is recommended.

(1) Cut the tubing end square and file away burrs and rough edges.

(2) Place the compression screw over the tubing—tapered end last.

(3) Insert tube into coupling body until it seats.

(4) While holding tube in place, tighten compression screw firmly.

S.A.E. Flare Joints

An S.A.E. flare joint using Imperial fittings is shown in Fig. 4.

It consists of nut pieces which are long and tapered with no groove on the hex, and a body which has a beveled face beyond the threading.

Before assembling this type of joint, be sure the end of the tube to be connected has been cut-off squarely and is not out of round. Any burrs on the inside of the tube should be carefully removed. To assemble, slip the nut onto the tube, with the long tapered end first, and flare the tube to a standard S.A.E. 45° flare. The efficiency of this type of joint depends to a large extent upon the accuracy with which the flare is made. The use of a reliable make of flaring tool is advisable.

The nut is then screwed onto the fitting body, drawing the flare on the tube up against the flare seat on the body. A drop of oil on the flare face before assembly will help to assure a tighter connection.

The flared type joints are well adapted to high pressure service and have exceptional resistance to mechanical pull-out. They are especially adapted for use where a joint is to be subjected to periodical disassembly as they will give repeated tight connections.

The positive nature of the joint with the flare on the tube clamped between the nut and the body of the fitting makes for extreme dependability and safety. This type joint can be used with copper, brass, aluminum, block tin, Monel, Everdur or thin wall soft steel tube for carrying liquids or gases on low, medium and high pressure work and on a wide range of mechanical equipment, and also for general purpose applications where excessive vibration or tube movement is not involved.

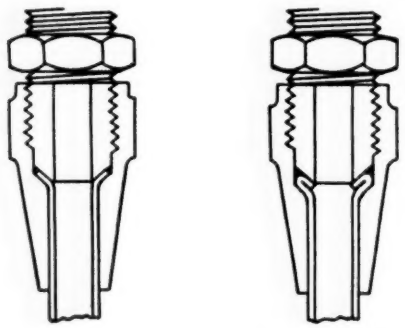


Fig. 5. Single and double flared joint.

Where used for refrigeration or air conditioning installations, forged bodies instead of cast are required on angle fittings; brass forgings are used for nuts; extruded bronze rod is used for female couplings and cap nuts. Similar fittings are generally used for marine installations.

Flared fittings, are also used for liquified petroleum gas installations. They are available for sizes $\frac{1}{8}$ to $\frac{3}{4}$ in O.D. tubing.

Tube may be either single or double flared for making flared fitting joints. See Fig. 5. When working with Bundy steel or similar tube, the double flare is recommended to insure against cracking or splitting of the tubing in flaring.

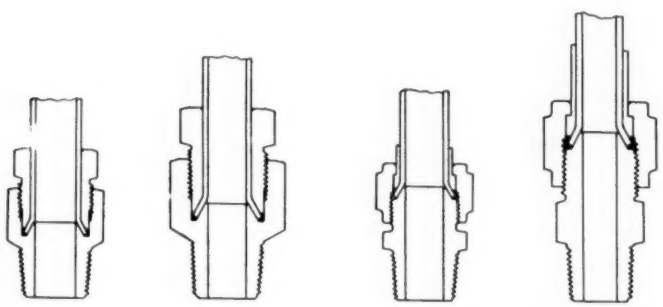


Fig. 6. Left to right, Parker tube couplings: Standard type, standard weight; standard type, XX weight; triple type, standard weight; triple type, XX weight.

While single flares are today by far the most commonly used in connecting copper, brass and aluminum tube, there is a tendency toward the use of double flares for installations which are to be subject to frequent disassembly and reconnection.

The bulk of the use of double flares is in tube sizes $\frac{3}{8}$ in. O.D. and smaller as it is in these sizes that the double flare offers its principal advantages.

Single and double flare joints are shown in Fig. 5.

One of the advantages of a double flare is that an effective seal is secured with specified wrench torques and yet maximum wrench torques for single flares can be exceeded by a considerable margin without ironing-out or washing-out the flare. This eliminates much of the danger of weakening the flared joint through overtightening and is especially desirable for tubing joints which must be taken apart and reassembled frequently. Tools for double flaring as well as single flaring are available.

Inverted Flare Joints

In Fig. 6 are Parker standard and triple type standard weight and XX weight inverted flare type joints. The standard type joint consists of two pieces, a female body which has a raised flare face inside the fitting, and a male nut which is screwed into the body.

This particular make of joint uses a 30° flare angle in place of the customary 45° or 60°. This allows a longer clamping surface and a greater wedging or clamping force on the flare than is possible with 45° flare with the same wrench torque. The nut is supported solidly by the body of the coupling as the nut is tightened down on the flare. This prevents the nose of the nut from bulging or distorting and insures good clamping action on the flare.

The triple type joint consists of three pieces; a male body, a female nut and a sleeve. This sleeve which fits inside the nut and over the tube provides a support for the tube; the shoulder prevents any wiping action on the flare when the nut is screwed onto the body. The design of the triple type coupling is such that the clearance provided between the nut and the sleeve makes the latter self-aligning on the flare and also easier to assemble. This results in an even clamping action on the tube flare assuring a leakproof connection.

Normally, brass couplings are used with copper tube; steel couplings with steel tube; aluminum alloy couplings with aluminum alloy tube. Steel couplings and tube must be used in many cases where the actual pressure requirements indicate brass couplings and copper tube would be satisfactory as follows:

(1) Where highly dangerous or expansible fluids (gases) are carried.
(2) Where lines are subject to successive mechanical abuse or shock loads.
(3) Where temperatures are over 500F.

Steel couplings are sometimes used with copper or aluminum tube in place of brass or aluminum alloy couplings where the coupling itself is subject to mechanical abuse or continual assembly and disassembly.

When making this type of joint, tube ends must be cut squarely, and the ends should, if necessary, be filed square and all cutter or hacksaw marks removed. Inside burrs should be removed with a knife or scraper and outside burrs with a flat file.

All filings, chips, grit, etc. should be removed from the inside of the tube by blowing with compressed air or by pulling a rag through the tube.

Flares should be square and concentric with the

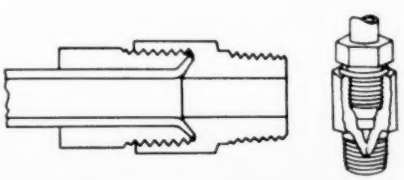


Fig. 7, left. Weatherhead inverted flared joint. Fig. 8, right, Hi-Duty joint.

tube and tube nut in order to seat properly. Tubes flared too long will stick and jam on the threads when assembling. On tubes which are flared too short the full clamping area of the coupling is not utilized.

A Weatherhead inverted flare type joint, Fig. 7, also has a female body with a raised flare face inside the fitting, and a male nut which screws into the body. The nut is short, squarely cut and is slightly belled inside at the end.

Hi-Duty Joints

A Hi-Duty joint using Imperial fittings, Fig. 8, has a body with female thread, seat for tubing, and fairly long belling beyond the threading. A sleeve with a groove is attached to a male nut, making this a two-piece joint. The sleeve shears off at the groove during assembly, becoming a permanent part of the tube.

No special preparation of the tubing is necessary and since the fitting comes with the nut and sleeve assembled, it is only necessary to insert the tubing through the nut into the fitting body so that it bottoms squarely against the seat inside the body, and then tighten the nut.

This type joint is used with copper, brass, aluminum, block tin, Monel, Everdur, seamless steel, tinned Bundy and similar tube.

It is used for gasoline, oil, grease, vacuum and air lines and for general purpose medium pressure work. It is widely used where there is minor vibration and where fittings must stand up under severe service. It is extensively used on tractors, trucks, power units, electric locomotives, etc. The advantages of this joint are that no flaring or other special preparation of the tube is necessary and the joints are speedily assembled reducing installation time and cost. It is an excellent type of joint for use where there is minor vibration. Tests have shown that under vibration, Hi-Duty joints have stood up without failure, on an average, eight times as long as joints made with ordinary compression or flare fittings.

Fittings for this type of joint are available for $\frac{1}{8}$ to $\frac{3}{4}$ in. O.D. tube.

Flex Joints

This is a three-piece joint, Fig. 9, consisting of a body piece similar to that used for a compression joint but with a larger opening to take belling on end of the tube. The sleeve is made of synthetic elastic material. The nut resembles the compression nut but has the distinguishing extension beyond the hex.

The joint is assembled by slipping the hex nut and the sleeve over the end of tubing, then belling the end of the tube slightly with a flaring tool or 45° punch. When the nut is screwed onto the body and tightened, the sleeve is compressed against the end of the fitting body and against the tube, making a joint that is pressure tight but which permits the tube to flex in any direction.

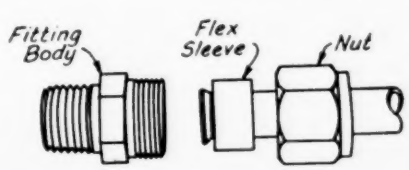


Fig. 9. Flex joint.

This type joint is especially designed for use with thin wall steel tube such as Bundy, and copper tube. It can also be used with aluminum, brass, Monel and Everdur tube.

It is used for connecting metal tube where there is major vibration or where parts joined by tube vibrate in different planes and amplitudes. It is used for gasoline, grease and oil lines on automobiles, trucks, tractors, buses, power units, etc., and other low and medium pressure applications. It can be used in many instances in place of flexible lines.

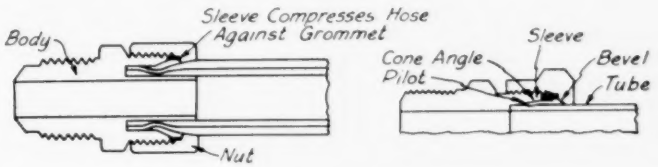


Fig. 10, left. Flexible hose joint. Fig. 11, right. Details of the Ermeto joint.

Its particular advantages are that it solves the problem of tube failure due to vibration, and is much cheaper than flexible tube. The sleeve of synthetic elastic material forms a cushion between the tube and fitting so tube can actually be flexed back and forth in the fitting and yet retain a positive seal. Under test conditions this type of fitting has withstood over 10,000,000 vibrations without failure. It is available in tube sizes from $\frac{1}{8}$ to $\frac{7}{8}$ in. O.D.

Flexible Hose Joints

A flexible hose joint, Fig. 10, using Imperial couplings, is a three-piece joint consisting of a body with a grommet extending from the center of the cavity. The sleeve is tapered in one direction only. The nut is similar to a compression nut except that the seat for the sleeve at the bottom is square instead of being belled.

To assemble this joint, cut off the flexible hose squarely with ordinary cutting pliers. Pass the hose through the nut and sleeve (the tapered end of the sleeve last) and push the hose into the body of the fitting over the grommet as far as it will go. Assemble the nut on the body and tighten as much as possible. The hose is compressed between the sleeve and the grommet as illustrated giving a tight leakproof joint.

This type fitting is used with Imperial FN flexible hose which is a special synthetic lined fabric covered hose finished with a high luster heat and oil resistant flexible lacquer.

It is used for making up flexible gasoline, oil and grease lines for automobiles, trucks, power units, etc. It is especially adapted for replacement work.

Hose is supplied in 25-ft lengths and can be cut to any needed length. As a wide range of fittings are available it is a simple matter to make up any desired flexible gasoline, oil or grease line in a few minutes. The hose is strong and durable and will stand severe twisting and bending. It has an oil and gasoline proof

Table 1 – Comparative Results of Fitting Tests

Type fitting on test assembly	Type Test for Fitting With S.A.E. 1020 Steel Tube		
	Bursting Test— lb per sq in.	Pull Test— lb tension	Vibration— Cycles
Ermeto	Tube burst at 22,500	Fitting pulled off at 2,466	Tube failed after 21,750,000
Flare	Fitting blew off at 21,000	Fitting pulled off at 1,683 lb.	Tube failed after 16,500,000
Compression	Fitting blew off at 6,750	Fitting pulled off at 795	Tube failed after 6,750,000

synthetic lining and a working capacity of 150 to 300 lb per sq in.

Ermeto Joints

In Fig. 11 are shown the parts and method of assembly of an Ermeto joint using steel fittings manufactured by the Weatherhead Co.

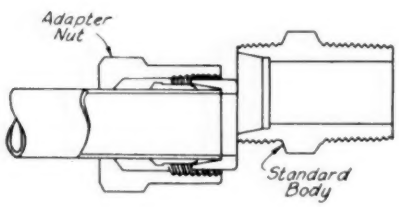


Fig. 12. To show ease of assembling Ermeto close coupling joint.

This also is a three-piece joint for use with steel, annealed copper, annealed brass, Everdur, Monel, chrome molysteel etc. in sizes ⅛ to 1½ in. O.D. Extra thin wall tubes should not be used. The manufacturer recommends wall thickness from 0.022 in. for ⅛ in. O.D. to 0.083 in. for 1½ in. O.D. steel tube, and wall thicknesses from 0.035 in. for ⅛ in. O.D. to 0.095 for 1½ in. O.D. copper tube. The three parts are a male body with a conical shaped recess terminating with a square shoulder which serves as a stop for the end of the tube; a sleeve which is beveled for the nut and has a sharp cutting edge with a pilot on the end which enters the male body; and a female nut with a beveled recess for the end of the sleeve.

When assembling, the nut is first placed on the tube and then the sleeve with the pilot and cutting edge toward the body. The tube is then pushed home against the shoulder in the body and the nut screwed onto the body. As the nut is tightened it forces the sleeve forward until the leading edge meets the angle in the body. This causes the pilot of the sleeve to contract, and forces its cutting edge to shear a groove into the outer surface of the tube, giving a tight joint between the fitting and the tube, even though the outer surface of the tube is rough.

The nut presses on the bevel of the sleeve causing it to grip the tube, giving additional support and absorbing vibration.

Since the cone angle in the body is gradual, about 24°, there is a minimum of compression force on the tube, with the results that no closing in or deformation of the tube occurs even though the tube wall is thin.

The pilot prevents the sleeve cutting too deeply into the tube. The sleeve does not close the tube in but grips it from the outside. Table 1 of the comparative results of tests made on SAE1020 steel tubing with Ermeto, flare and compression fittings is from information published by the manufacturer.

Reducer couplings use standard bodies with an adapter. The adapter has approximately the same outside diameter as the inside diameter of the nut and has a cone shaped opening of proper size to fit the reduced size tube. The adapter nut is longer than the regular nut in order to accommodate the reducer. A standard sleeve is used and when assembling, the adapter is placed on the end of the tube after the adapter nut and sleeve. When the nut is tightened, the square face of the adapter seats on the end of the body and the sleeve is forced into the conical opening of the adapter making a tight joint in the same manner as for the regular joint.

A close coupling using an adapter is shown in Fig. 12. The adapter is similar to that used for a reducer. With this type of joint, assemblies can be made in close quarters, as no end movement or flexing of the tube is required.

A comparison of the conventional method of making a diesel fuel injection line connection with the end of the tube upset and a connection made up with Weatherhead Ermeto fittings is shown in Fig. 13.

The manufacturers claim longer life of injection tubes under severe vibration for this type of joint than with the conventional type of joint and that service installations and repairs can be completed in much shorter time because it is not necessary to upset the ends of the tube.

When assembling Ermeto fittings, the end of the tube should be pressed firmly against the shoulder in the fitting, the nut turned up finger-tight, and a wrench applied to turn the nut approximately two turns. This will set the sleeve and insure a tight connection. Excessive tightening is not necessary and will lead to distortion.

Reassembly is obtained by turning nut up finger-tight and applying a wrench for approximately ⅛ of a turn.

Before assembling, be sure that the seat in the body of the fitting is clean. Do not allow any chips or dust to remain on the tube or the Ermeto sleeve when inserting into the fitting body. A slight amount of oil on the threads and tube facilitates easier assembly of the parts.

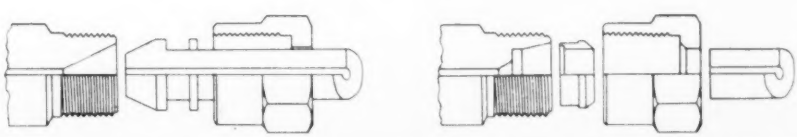


Fig. 13. Comparison between conventional, left, and right, Ermeto diesel fuel injection line connections.

Experience is my Classroom

By T. W. REYNOLDS

BREECHING BECOMES A SOOT COLLECTOR

In engineering design you can get things too big. Thus, an oversize smoke breeching will settle out most of the soot in the breeching rather than in the chimney where it could be more easily removed through the cleanout door at the base of the stack. You can also get boiler, burner, pipes and air vents so large that you will pass steam and make condensate in the pipes too fast on pick up, especially so in one-pipe steam-heating system.

Harking back, however, to the matter of smoke breechings, the writer encountered one where the designer finding the opening to the stack necessarily limited in area, figured to overcome this defect by making the breeching itself of much greater depth.

He reasoned that the stack opening was but an orifice without resistance through which the velocity of gases could be speeded up. The gases did speed up and left the soot behind in the depth of breeching below the bottom of the stack opening. No harm resulted in this case, for as soon as the bottom of the breeching was filled up to the opening, additional soot was carried along by the increased velocity and settled out within the stack.

NOT FOR DUPLICATION

A friend, Jed Holtzman, and his partner, Bridgmen, at the time young building contractors of Hastings-on-Hudson, N. Y., upon complaint of a house owner, took upon themselves to search for a gas leak by means of matches. They did not smell any dangerous concentration of gas and had seen employes of the gas utilities do this very thing, that is, use a lighted match at pipe fittings to detect leaks. Men of the gas company did this, however, with discretion after first making certain that everything else was all right.

The boys did get an occasional blue flame as they neared the gas fired domestic water heater, eventually came too near, then an explosion which blew them a few feet, but without injury.

What they had neglected to find was an extinguished pilot light. Accumulation of gas within the heater was touched off by their matches as they got too close to the open down draft diverter atop the heater.

BEAR FACTS

It was a good advertising stunt to sell furs—to put a couple of cub bears in a department store show window. A bit of conditioned air was also put in to prevent the bears from passing out, since such places are sometimes so hot that their sprinkler heads have been known to open. The cubs felt better with the cooler air and during the night frisked around in play until they had pulled a lighting fixture loose. The resulting short circuit started a fire, which, however, was soon discovered and extinguished.

Animals in show windows should be confined to wire cages. No doubt the best way is to stuff the animals and do as was done in one department store around Christmas time. In this case, a stuffed deer was placed in a very realistic manner as though he had just crashed through the glass. Half of the figure was inside; the half with the head was outside. Many a person was fooled by the painted cracks in the window which radiated from the deer to create the illusion that the store window was broken by the deer.

SUPPOSE A POWER HOUSE WAS LEFT UNATTENDED

The writer has often wondered what would happen if the attendents of a power house were to go on strike and leave the building with all the boilers and machinery in operation.

Supposedly nothing would happen so long as fuel was automatically fed from an ample storage. If fuel were finally exhausted, dwindling pressures would in time reach the point where pressure controls would no longer function and some things might then get out of hand.

Leaving the controls out of the picture, the engines, pumps and other steam-using apparatus would continue to run until the steam was exhausted from the boilers, then the machinery would gradually come to rest and electric generators would no longer function.

During the course of the war, a power house in England was vacated by every one during an air raid, but all was going smoothly when the employes returned. Off the coast near Africa, a ship was suddenly vacated as it was apparently sinking from a torpedo hit. Some time after, when it still remained afloat, it was boarded and everything was found running as smoothly as when the crew left. It was towed safely to port.

WHY WALL PAPER UNPASTES

A correspondent in Canada asks "Just what is it that makes wall paper unpaste, is it a lack or a surplus of humidity?" and he adds that no one has ever given him a satisfactory answer. His is a good question, however, and one to ponder over.

The correct answer, regardless of whether papered walls are observed wet or dry, is that neither humidity nor the lack of it has anything to do with the problem, though it is obvious that drying will be quicker in a heated space. Paper applied on a damp wall, or when the weather is humid and the space unheated, will bubble. It may or may not return to its original smooth surface and may unpaste. Once a wall has dried out, however, and the paper is properly applied, nothing will cause it to unpaste. Some walls (due to their construction or condition) do take paper better than others while some paper hangers have more skill or use more thought and care than others in the preparation of the wall surface or of the cold sizing glue which they dilute and make watery.

Unpasting of wall paper may be caused by a porous wall absorbing the ingredients of the glue, or by an under plastered wall, free lime in the plaster, or a wall under-trowelled to reasonably hard finish. There must be the proper suction and plaster, not too much, just enough to hold the size. If the wall is trowelled too hard like glass, it must be washed down with vinegar to open it up. Most difficulties of today in staying-put are due to hasty papering and painting before the plaster dries. There is no time left for it to dry, so that the moisture keeps the lime active.

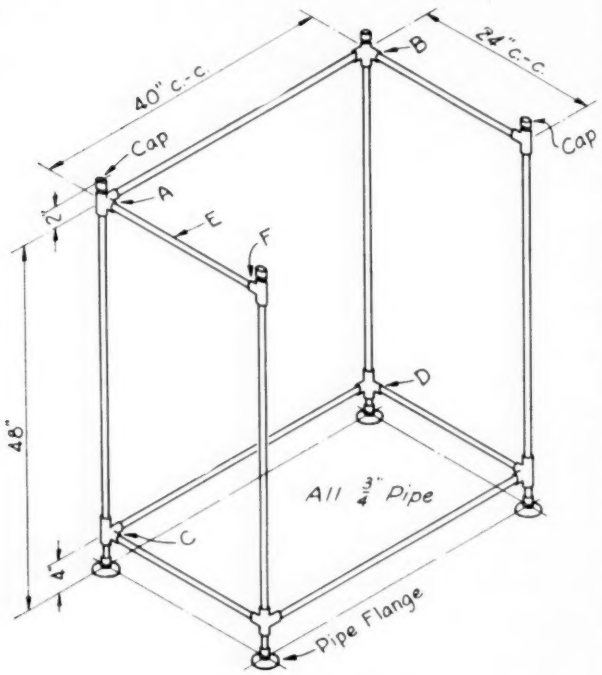
An interesting case of wall paper which unpasted only recently on one wall and not on two adjacent walls

Note: Mr. Reynolds is Chief, Air Conditioning Division, Abbott, Merkt & Co., Engineers, New York.

recently came to my attention. It was in a neighboring office of the skyscraper where I work. A large room was divided as per the times into two offices. Wall paper, which, by the way, is all the present rage, was applied on the two old walls and the new dividing wall. It came off on the two new walls, stayed on the old. The plaster on the old walls, long since applied, had been properly mixed or had aged, but there was too much lime in the plaster of the new wall. Lime in the plaster, of course, makes it work easier. It an old trick.

PLAN RACK

Selected at random from the writer's sketch file are sketches giving two different approaches to the problem of having a plan rack that will make plans quickly available when wanted.



A pipe rack for filing plans.

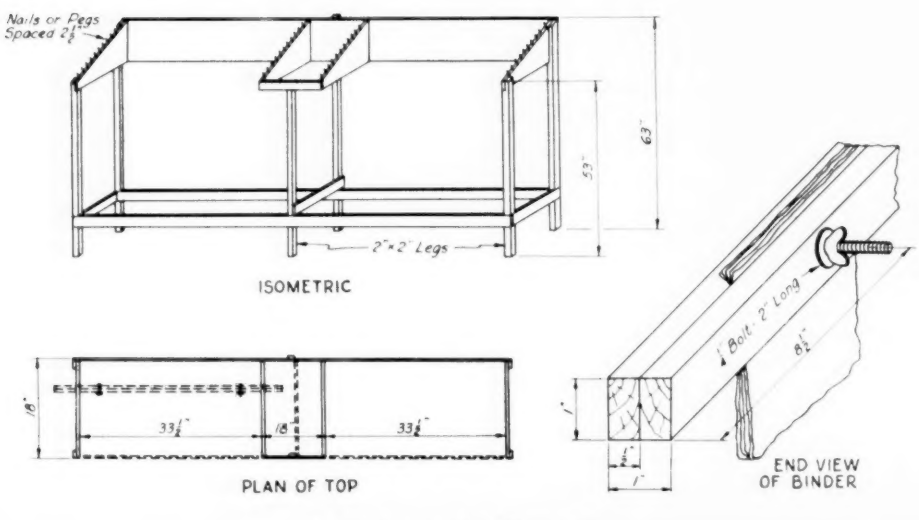
When one starts out to design a good plan rack, one soon learns that it is not as simple a thing as at first believed. A sketch of what some one else has done should be of help as a starter if only to provide the designer with an opportunity to make his rack different than the sketch.

The wood rack is designed with a slanting top so that the particular set of prints desired can be noted easily and quickly removed from the rack. The same advantage could be obtained with a pipe rack when modified accordingly. The pipe rack is light, of good appearance and takes up very little space.

The pipe rack illustrated was manufactured for sale within the garment center of New York City for holding garments. No pipe unions are used in this design, hence pipe *E* has a long standard machine or straight thread at *A* rather than the standard tapered pipe thread (tapered pitch diameter for the thread). When assembling the rack, the pipe *E* is inserted in *A* far enough to clear point *F*, then backed partly out so as to thread in the usual manner with the fitting at *F*. Points *B*, *C*, and *D* also have straight threads.

The wood rack illustrated is dimensioned to suit 23 in. by 36 in. plans. Plans of varying size can be bound to fit on the same rack by increasing the distance of bolt centers. An alternate method is to use a standard size for every plan. In some instances the bolts will not pass through the plans, yet seem to hold as well.

The rack of wood has two divisions, one for mechanical, the other for architectural. Single racks, however, can be easily moved about or combined in multiples. They are more likely to fit in a space.



A wood rack for filing plans.

EXCESS RADIATION

Shortly after World War I the writer was employed as an engineer by a large boiler and radiator company. Present day light weight cast iron radiation was then being introduced and received with much skepticism as to ratings. So it came as a considerable surprise when an engineer called up and complained that he was overheating industrial spaces when using wall type radiators at their given ratings.

Now the output of such radiators was and still is commonly accepted as 300 Btu per sq ft of rated surface, the same as it is with pipe coils. The actual surface, however, is even greater in most cases than the rated surface. For example, a radiator with an actual surface of 9.26 sq ft is rated at 9 sq ft simply because of convenience in tabulation and use. The decimal point is eliminated.

The actual output when installed at other than ceiling location is also in excess of the given 300 Btu. It varies with the dimensions of the section used, the number of tiers high and the number of such sections in the assembly, increasing with the lower heights of sections, with sections having vertical bars and with decrease in number of sections forming the assembly.

Notwithstanding, the foregoing comments, the real reasons for overheating of the spaces as complained of by the engineer were many. Overheating was partly due to the greater proportionate amount of radiant surface in such type of radiation, to the heat from connecting pipes and to the length of such radiator assemblies distributing the heat and heating the infiltrating air. It may also have been increased due to heat from lights, population, sun effect and industrial processes, as well as to the engineer's factors of safety.

AIR CONDITIONING BY WELL WATER BECOMES A DRUG ON THE MARKET

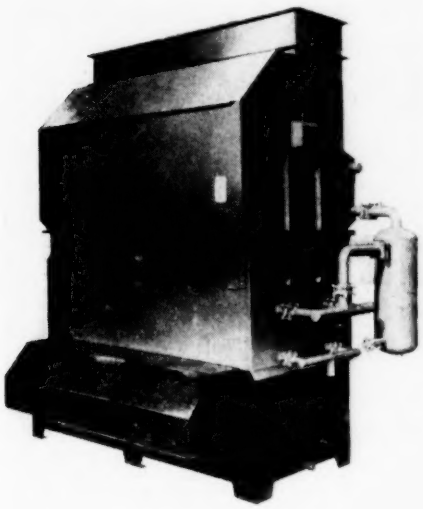
The well was open for repairs, the building caught fire and in that building was a drug store. Firemen pumped the basement full of water, so it was not long before the neighboring wells of other office and mercantile buildings evidenced the presence of drugs. Drinking water in such places could not be used, nor was it advisable to continue air conditioning until the situation improved. This was a freak condition, but it shows the advisability of avoiding a direct connection between city and well waters. The use of well water for drinking purposes is tempting, however, for it is cooler, there is no refrigeration cost, and sometimes the water has a better taste.

NEWS OF EQUIPMENT AND MATERIALS

Condenser

NAME—Niagara Aeropass condenser.

PURPOSE—To condense refrigerant gases and to improve operation



through keeping head pressures at the minimum.

FEATURES—Interior of casing is partitioned into two parts so that by the operation of dampers, either all fresh air may be used or any degree of air recirculation. This varies with the condensing load and weather changes. In winter, when the heat in the refrigerant gas is not sufficient, an electric heating element in the spray water tank starts to function to prevent freeze up. All dampers are located internally, protected from outside weather conditions.

OPERATION—Condensing is done by passing the gas through two coils in an air stream. The dry Duo-Pass coil and the Oil-Out remove the super-heat and condense and separate oil vapor from the refrigerant. The wet coil condenses the gas at a low temperature. This coil, drenched by a water spray, removes 1,000 Btu for each pound of water evaporated. Spray water is recirculated. Make-up water is needed only for that evaporated.

SIZES AND CAPACITIES—10 to 100 tons.

MADE BY—*Niagara Blower Co., 405 Lexington Ave., New York 17, N. Y.* 133

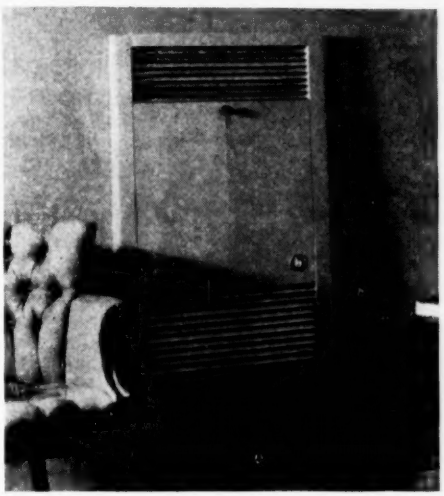
Gas Heater

NAME—Holly heater.

PURPOSE — Vented heater for installation within the wall so that space on both sides of a partition can be heated.

FEATURES—Heater requires a wall opening of 28 by 51 in. Bottom of panel is off the floor and air inlet is located in a hidden duct beneath the raised panels. Top panel louvers give a downward and outward direction to the warm air flow. A hinged door gives quick access to all parts which are built into an integral assembly. Easily installed or removed for service. Assembly includes a pilot and main burner valves. Burner is cast iron with multiple-slot design. A safety shut-off automatically closes intake in case of interrupted service.

SIZES AND CAPACITIES — Units are available with inputs of 37,000 to 45,000 Btu for natural or manufactured gas and are also available for LP gas.



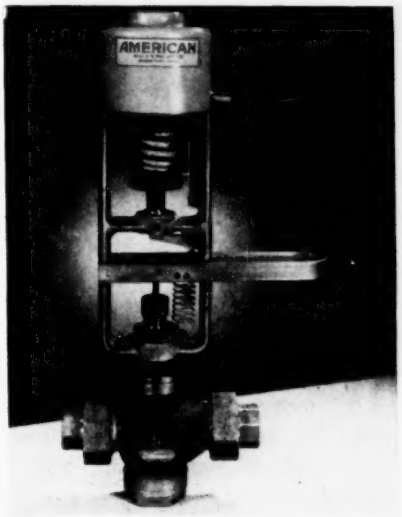
MADE BY — *Holly Manufacturing Co., 875 S. Arroyo Pkwy., Pasadena 2, Calif.* 134

Temperature Regulator

NAME—American temperature limiting regulator.

PURPOSE—For use in providing a positive shut-off on processing machinery when critical temperature is reached.

FEATURES—Steam supply is shut off when critical temperature is reached. Bulb and line is made of stainless steel. Bellows, of one-piece design, is said to have great sensitivity. Snap action



mechanism of regulator is of stainless steel and the operating parts are ground to accurate precision. Valve body is of heavy bronze capable of withstanding pressures up to 250 lb. Removable valve seat is made of stainless steel. Stainless steel valve disc is center guided to diminish turbulence in the flow of steam through the valve.

SIZES AND CAPACITIES—½, ¾ and 1 in. and for temperatures of 20-345F.

MADE BY—*Manning, Maxwell & Moore, Inc., Bridgeport 2, Connecticut*.....135

Oil Cleaner

NAME—Houghto-Solv.

PURPOSE—Fuel oil additive to clean oil systems from tank to stack.

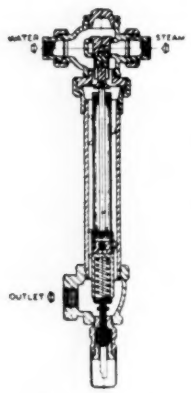
FEATURES—Additive is said to be non-corrosive and to be free from injury to metals or working parts of the heating system. Beside removing the sludge in the oil tank, makers claim it stops formation of soot. Compound is added to the fuel tank in the ratio of 1 qt to 1,000 gal of fuel oil.

MADE BY—*E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia, Pa.*.....136

Steam and Water Mixer

NAME—Sarco steam and water mixer type SWV.

PURPOSE—To provide a supply of hot water at isolated locations remote from the general hot water supply.



FEATURES — Mixers are provided with a captive spring held in a split housing, the two halves of which are held together, with the spring compressed, by fusible solder. Should the temperature of the water flowing over the spring for any reason exceed the melting point of the solder the spring will be released, closing the steam valve. A surge tank is supplied with each mixer and should be installed on the discharge side. It smoothes out the momentary temperature fluctuations caused by surging when starting the mixer. Two cast iron strainers are also part of this assembly.

OPERATION—As water in the mixer heats up, oil in the thermostat expands and pushes a forward plunger against the spring to position the valve head which controls the steam supply to maintain the desired hot water temperature. Temperature is adjustable, 15F lower and 35F higher than factory calibration. A relief spring takes up excessive expansion of the thermostat through accidental overheating.

MADE BY—*Sarco Company, Inc., Empire State Bldg., New York 1, N. Y.* **137**

Gas Burner

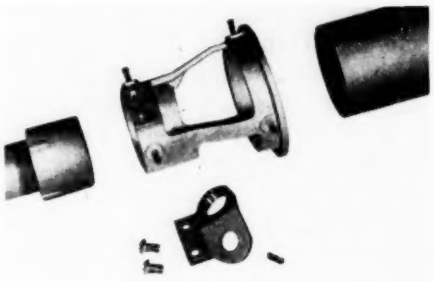
NAME—Bryant burner for immersion heating.

PURPOSE—Assembly designed to insure the entrainment of the proper amount of secondary air in gas-firing immersed tubes for heating liquids.

FEATURES — Coil cages are furnished separately or in ready-for-installation assemblies, complete with mixers and associated equipment. The atmospheric type of coil cage burner consists of a gas cock, low pressure injector, flame-retaining burner nozzle, and coil cage with pilot. It is usable with gases having a Btu content of 450 to 3200 Btu at pressures from 3 in. W. C. to 12 in. Blast type assembly consists of a zero governor for controlling gas supply and a pressure type mixer. Air is used at 4-oz, 8-oz, or 16-oz pressure and the assembly delivers up to 1,400,000 Btu per hr.

LITERATURE AVAILABLE — Bulletin 1C-1.

SIZES AND CAPACITIES — Atmos-



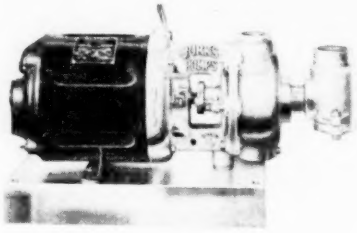
pheric type is rated at from 27,500 to 350,000 Btu per hr.

MADE BY—*Bryant Heater Co., Industrial Division, 1020 London Rd., Cleveland 10, Ohio.* **138**

Turbine Pump

NAME—Burks super turbine pumps, series 13C.

PURPOSE—Pump unit directly connected to motor.



FEATURES—Pump unit has bronze impeller and raceway, one-piece stainless steel shaft. It is self-priming and has only one moving part. Pump is connected to a single phase motor of the repulsion start, induction run, long hour service type with built-in overload protection. Pump can be supplied in all bronze construction for handling brine and acid solutions.

SIZES AND CAPACITIES—Motor size from ½ to 1 hp; pump capacity from 230-1520 gallons per hour at heads from 10 to 100 ft.

LITERATURE AVAILABLE — Catalog No. 67.

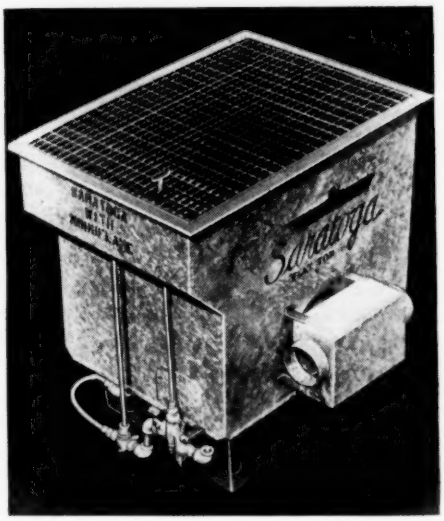
MADE BY—*Decatur Pump Co., Decatur, Ill.* **139**

Floor Furnace

NAME—Saratoga floor furnace.

PURPOSE—Floor furnace with a gas burner for space heating.

FEATURES—The Moduflame raises or lowers the size of the flame according to the heating needs of the area being served. When the thermostat calls for heat the size of the flame increases and then

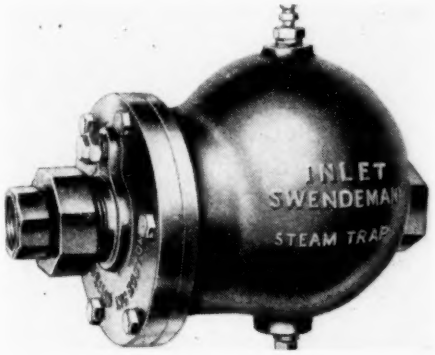


modulates back to a small standby flame to keep the air moving through the furnace. A bellows type throttling thermostat is used which is operated by the temperature of the air as it returns into the control section of the furnace. Bellows expand and contract to release the proper amount of gas to the burner at all times. A safety device is installed at the head of the burner to provide a complete shut off of gas in case of line stoppage or pilot flame failure.

MADE BY—*Mahl Mfg. Co., 3081 E. Slauson Ave., Huntington Park, Calif.*.....**140**

Steam Trap

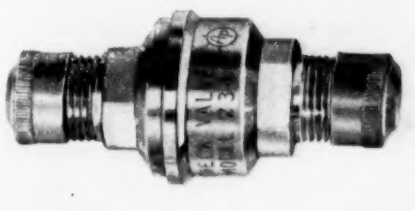
NAME—Swendeman steam trap.
PURPOSE—Steam trap operating on a float valve principle.
FEATURES—Body and head of trap are made of high quality semi-



steel and all parts, including the air vent which is located on the outside of the body, are accessible for inspection and repairs. Internal working parts are bronze with stainless steel valve and seat. Any necessary replacements of valve and seat can be made without removing trap from the line. Float is of seamless high-pressure construction. Trap operates without time lag so that condensate can be removed as fast as it collects.
SIZES AND CAPACITIES — Available in seven sizes for ½ to 2 in. steam lines.
MADE BY—*The Leavitt Machine Co., Orange, Mass.* **141**

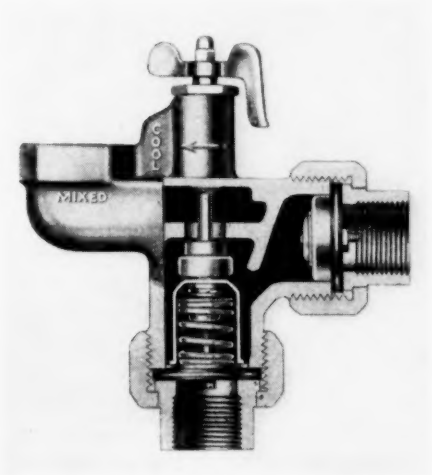
Check Valve

NAME—Automatic Products Model 234 refrigerant check valve.
PURPOSE—For installation in a refrigerant suction line to prevent backflow of the refrigerant from high to low temperature evaporator in a 2-temperature system during the off-cycle period.
FEATURES—A positive seal-off at all pressures is accomplished by combining a metal valve disc with a carefully finished brass seat. Since the disc and seat are said to resist corrosion, valve can be used with all refrigerants. Check valve can be installed in any position. Valve disc is stem-guided and is held in place by light spring pressure so that its position is not affected by gravity.
LITERATURE AVAILABLE—Bulletin.
MADE BY—*Automatic Products Co., Milwaukee 10, Wis.* **142**



Tempering Valve

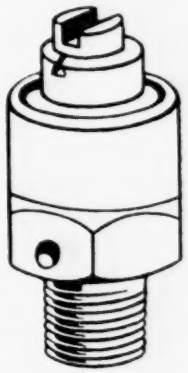
NAME—Taco Type A adjustable tempering valve.
PURPOSE—For controlling hot water



temperatures at faucets in residences and small buildings.
FEATURES—Valve is readily adjusted by external pointer knob to deliver water temperatures from 120 to 150F. Thermostatic element used is said to be free from corrosion and to have a long operating life. Available in all brass, bronze and stainless steel construction.
SIZES AND CAPACITIES—Supplied in ½- and ¾-in. sizes.
MADE BY—*Taco Heaters, Inc., 137 South St., Providence, R. I...* **143**

Air Valve

NAME—Dole No. 16 automatic hot water air valve.
PURPOSE—For automatically eliminating air from convectors and radiators.
FEATURES—By means of a simple screw adjustment, valve can serve as a manual shut-off, automatic air elimination device, or a manual venting unit. When venting element is wet, it will permit air to leak out, but not water. If it dries out due to low water level, element has to be soaked in water for one hour.



MADE BY—*The Dole Valve Co., 1933 W. Carroll Ave., Chicago 12, Ill.* **144**

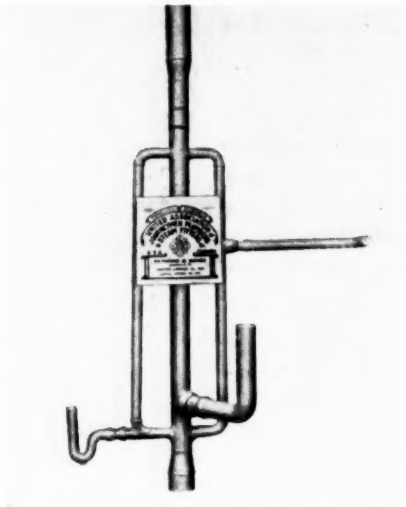
Portable Fan

NAME—Westinghouse Mobilaire.
PURPOSE—Portable fan for room cooling.
FEATURES—Fan has large-surface Micarta plastic blades. Five curved injector rings surround the blades. Makers claim that the added twist of the blades raises the fan's capacity 45%. Fan is supported by two slender steel columns, which in turn are mounted on a pair of rubber wheels. Height of unit can be varied so that it can be used with windows of different types and heights; with sills from 15 to 39

in. above the floor. Fan is powered by a two-speed capacitor-type induction motor.
MADE BY—*Westinghouse Electric Corp., Pittsburgh 30, Pa.*.....**145**

Vent Stack

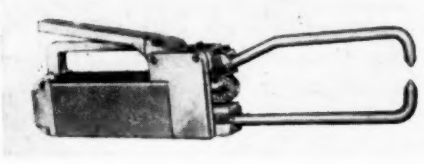
NAME—Vent stack assembly.
PURPOSE—Vent stack assembly with connections for bathroom fixtures assembled as one unit.



FEATURES—Vent stack is made up of steel pipe and welding fittings which can be fabricated in the shop and delivered to the building site ready to install. It is claimed that the new design saves up to 2 in. in wall thickness without sacrificing the inside diameter of the pipe.
LITERATURE AVAILABLE—Blueprint to serve as a guide to contractors in fabricating the unit in accordance with the codes in their particular localities.
MADE BY—*Tube Turns, Inc., Louisville 1, Ky.* **146**

Spot-Welder

NAME—Greyhound spot-welder.
PURPOSE—Lightweight portable spot-welder unit.
FEATURES—Unit is said to be suitable for use with sheet metal, and ventilating systems, and can weld metal up to $\frac{1}{8}$-in. thick. Unit is enclosed in a non-corrosive cast aluminum casing with an integral aluminum handle. The protruding copper arms are made in 6, 12 and 18-in. lengths. Special alloy tips are available in an assortment of shapes for specific needs. Each unit has a silicon steel and copper transformer wound with spun-glass insulated magnet wire. Welder is available in either 220 or 110 volts.
MADE BY — *Greyhound A. C. Arc Welder Corp., 606 Johnson Ave., Brooklyn 6, N. Y.* **147**



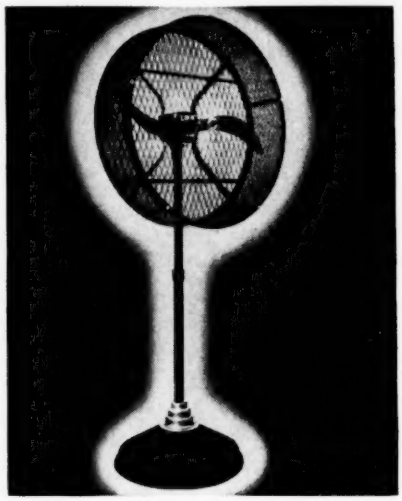
Air Conditioner

NAME—Typhoon packaged air conditioner.
PURPOSE—Room cooling.
FEATURES—Unit has a split-pan condensate removal system. The condensate pans also create an even

flow of air through the cooling coil to insure greater heat transfer. Condensers are copper with exterior return bends. Large, slow-speed compressors are used. Flexible copper tube is used for water connections. Large, slow-speed compressor is said to provide high output per horsepower at low noise level.
SIZES AND CAPACITIES—$1\frac{1}{2}$-, 2- and 3-ton.
MADE BY—*Typhoon Air Conditioning Co., Inc., Brooklyn, N. Y.*..... **148**

Fan

NAME—Model M-351 man cooler.
PURPOSE—For the ventilation of factories and commercial plants.
FEATURES—Unit has a 1/6-hp capacitor type G.E. motor operating at two speeds—750 and 1050 r.p.m. Motor is of the closed type. Unit has a 35-in. aluminum propeller. Height of unit can be changed. Over-all height is 90 in. and the minimum height is 66 in. Unit is also available for wall or post



mounting and for ceiling installation.
MADE BY—*Fresh'nd-Aire Co., Chicago, Ill.* **149**

Heating Element

NAME—Thermalink electric water-heating element.
PURPOSE — Water-heating element with a built-in adjustable thermostatic control.
FEATURES—Element is installed in ordinary domestic water tank by screwing a unit into the tank and connecting two wires to the electric current supply. Heating element can be set for any temperature be-

tween 120 and 180F. Elements are regularly supplied with copper sheaths for domestic water heating but can be supplied with steel sheaths for special applications.
SIZES AND CAPACITIES — Wattage rating of 600, 750, 1000, 1250, 1500, 2000, 2500, and 3000.
MADE BY — *Electro-Therm Inc., 8024 Georgia Ave., Silver Spring, Md.* **150**

Space Heater

NAME—Panelair.

PURPOSE—Gas-fired forced air wall type heater for space heating.

FEATURES—Unit can be fully or partly recessed in the wall and in direct contact with the wood. Warm air discharge is possible on all four sides so that several rooms can be heated by this one unit. Two fans draw air from the ceiling so that heated air is forced out near the bottom through small grilles. Makers claim that the low level warm air discharge counteracts the effect of cold air settling to the floor level. Fans and electric motors are vibration-insulated. The heating element is floated to absorb the expansion stresses. Operation is fully automatic.

SIZES AND CAPACITIES—Unit measures 29 3/8 in. across the front and is 9 3/8 in. from front to back.

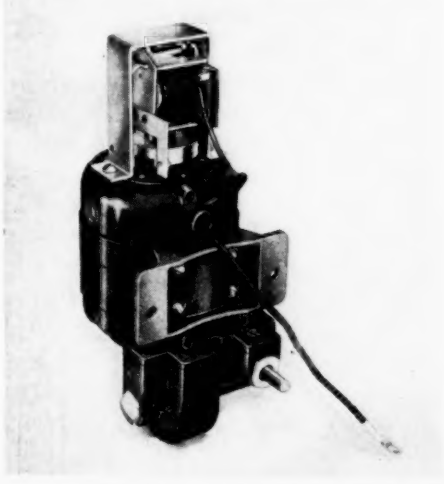
MADE BY—*Payne Furnace Co., Beverly Hills, Calif.* 151

Motor

NAME—Lectro-Max electric motor.

PURPOSE—Motor with a magnetic brake for instant stopping.

FEATURES—Makers claim unit fills all requirements for a gear motor operating on 105 to 125 volts, and 50 to 60 cycles a-c. Motor has controlled action with no runaway tendencies. It is equipped with a segmented armature insulated to endure a 1000-volt ground test. A two-speed built-in governor is available when required. Semi-oilless sleeve bearings are provided. When series wound, it can deliver up to 1/20th hp.



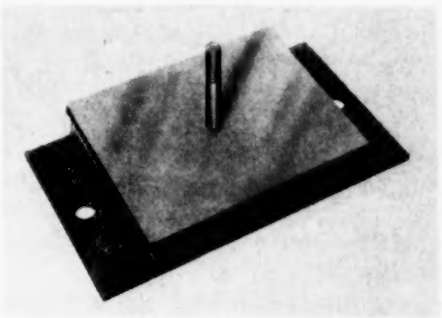
MADE BY—*Lectro-Max, Inc., Division of Magar Home Products, Inc., Geneva, Ill.* 152

Vibration Mount

NAME — Finnflex vibration dampner.

PURPOSE—Isolating machinery vibration.

FEATURES—Type CM-V is used for vertical vibration in top heavy and recoil type machines while type



CM-H is for horizontal and rotary vibration. In both types synthetic rubber inserts are held in place by steel retaining brackets and are said to be impervious to oil, sunlight, and grease. In use, the stud is inserted through the cored hole in the machine, then through the clearance hole in the mount, and into the snubber nut in the base plate of the mount.

LITERATURE AVAILABLE—Four-page folder.

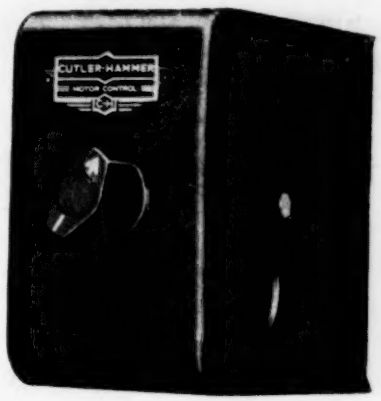
MADE BY—*Finn & Co., 2850 Eighth Ave., New York 30, N. Y.*.....153

Pressure Switch

NAME—Cutler-Hammer small size pressure switch.

PURPOSE — Designed for use with small compressors, oil pumps, or motor-driven pumps on a pressure system.

FEATURES — Two types are available. One has an external range adjustment for adjusting operating pressure. To maintain the accuracy of the calibration the differential adjusting screw is sealed.



The second type is without external range adjustments but has a slotted range adjustment screw and slotted differential adjustment screw inside the enclosing case.

LITERATURE AVAILABLE — Bulletin 10017.

MADE BY — *Cutler-Hammer, Inc., 247 No. 12th Street, Milwaukee, Wis.*.....154

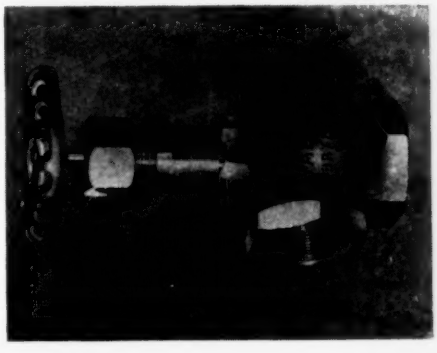
Angle Valve

NAME—Stainless steel angle valve.

PURPOSE—For general use in chemical and process industries requiring a stainless steel valve.

FEATURES—Valve is made of 18-8 MO, type 316 metal. A renewable valve seat of neoprene, hard rubber, or fiber is provided. A specially designed swivel permits pressure to be applied in closing without turning the valve on the seat thereby eliminating some cutting action.

MADE BY—*Valley Foundry & Machine Works, Inc., Fresno, California.* 155



Furnace

NAME—Airtemp steel furnace.
PURPOSE—Furnace which can be converted from hand-fired coal operation, to use of oil, gas or stoker.

FEATURES—Winter air conditioner for furnace is complete with a slow speed centrifugal blower, heavy duty motor, variable speed drive, and filters. The grates can be removed or installed in a matter of minutes. Blower compartment may be installed in either side of the cabinet so as to provide greater flexibility.
SIZES AND CAPACITIES—Available in 20, 22, 24 and 27-in. sizes.
MADE BY—*Airtemp Division, Chrysler Corp., Dayton, O.*.....**156**

Valve

NAME—T-flow control valve.
PURPOSE — Two-directional T-flow control valve for hot water circulating systems.
FEATURES—Unit has a cast iron body and the internal parts are

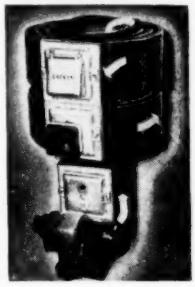
precision-tooled brass. It has a ½-in. outlet for expansion tank and is tested at 100 lb pressure.
SIZES AND CAPACITIES—For pipe sizes 1, 1¼, 1½ and 2 in.
MADE BY—*Quality Specialty Co., Inc., 211 N. 2nd St., Philadelphia 6, Pa.*.....**157**

Duct Connector

NAME—Bauer & Black duct connector.
PURPOSE—Flexible duct connector for ventilating systems.
FEATURES—Connector is said to be resistant to heat and light and to have a great degree of flexibility. A Fiberglas cloth is used in forming the connector and the adhesive supplied on the cloth is vulcanizable. One type of cloth used is neoprene-coated on both sides.
LITERATURE AVAILABLE—Illustrated folder.
MADE BY—*Industrial Tape Dept., Bauer & Black, Division of The Kendall Co., 2500 S. Dearborn, Chicago 16, Ill.* **158**

Furnace

NAME—Radiation furnace.
PURPOSE—Space heating.
FEATURES—Hot gases rising to the top of the combustion chamber circulate through the upper section of the heat exchanger and then overflow into the lower section before passing into the chimney. Each unit is provided with cleanouts so that all points of the inner flue surface can be reached for cleaning. Furnace has a safety blowout, repair openings, and a special pre-cast refractory. Standard equipment includes a high pressure gun burner, blower, motor, filters, humidifier, and draft control. Arrows in illustration indicate path of hot gases.



SIZES AND CAPACITIES—85,000, 110,000, 150,000 and 200,000 Btu at the bonnet.
MADE BY—*Radiation Furnace Corp., P.O. Box 613, Benton Harbor, Mich.*.....**159**

Union

NAME—Capitol union.
PURPOSE—For general use in joining pipe subjected to steam pressures up to 250 lb per sq in.
FEATURES—Union is made from bar steel in ¼ to ½ in. sizes. The ¾-in. size is a combination of bar steel and forged steel while the 1-in. size is made of all forged steel parts. Unit has a brass seat, ground joint in sizes from ¼ to 1 in.
MADE BY—*The Capitol Manufacturing & Supply Co., Columbus, Ohio.* **160**

MAY, 1948

TO OBTAIN FURTHER INFORMATION ON NEW EQUIPMENT

On the list below, circle the item number of the equipment in which you are interested, using the number found at the end of each item.

133	134	135	136	137	138	139
140	141	142	143	144	145	146
147	148	149	150	151	152	153
154	155	156	157	158	159	160

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NEWS OF THE MONTH

NATURAL GAS

makes strides in fuel market as reserves increase and pipelines expand.

The merger of three natural gas transmission companies, approved April 8 by the Federal Power Commission, focused attention on the growing importance of natural gas in the national fuel market. Shortages of heating fuels last winter and substantial increases in proved reserves of natural gas at the end of 1947 brought increasing awareness among consumers that the cost of natural gas, while climbing slightly, is doing so much more slowly than prices of other fuels.

• **MERGER.**—A favorable FPC decision last month involved the merger of the Memphis Natural Gas Co. and Kentucky Natural Gas Corp. with the Texas Gas Transmission Corp. to form one operating company to be known as Texas Gas Transmission Corp. W. T. Stevenson, executive vice-president of TGT and KNG, made the following statement from his office in Owensboro, Ky.:

"Texas Gas Transmission expects to apply to the Federal Power Commission within 60 days for permission to build a natural gas pipeline from Texas to a point near Middletown, Ohio. This line, larger in diameter than the Big Inch line, will connect with the present Memphis and Kentucky pipe systems to pump into existing lines a continuous flow of gas for heating, cooking and manufacturing.

"We also look forward to the prospect of meeting the problem of severe gas shortages that hampered the Kentucky system last winter by introducing a continuous flow of natural gas from new sources in Texas.

"The new line will not only serve the present Memphis and Kentucky systems but will also carry gas to Louisville, Ky., and to areas further east where the shortage of natural gas last winter caused exceptional hardship.

"Construction of the new pipeline would cost about $60 million."

• **BIG INCH.**—Texas Eastern Transmission Corp. spent $4,900,000 during its first eight months of operation to increase its daily delivery rate of natural gas through its Big Inch and Little Big Inch pipe lines from 140,000,000 cu ft a day to 235,000,000 cu ft a day, it was reported in a letter to stockholders from George R. Brown, chairman of the board, and R. H. Hargrove, company president.

During its first eight months, the company earned a net income after taxes of $1,670,329. Gross revenues for the eight months amounted to $9,553,580.

The company plans to spend an additional $20,100,000 for construction to reach a daily delivery rate of 433,000,000 cu ft a day to ten utility companies serving communities in Ohio, Pennsylvania, West Virginia and Indiana.

During 1947, the company added two reciprocating and three centrifugal compressor stations on the Inch lines, and ended the year with one reciprocating and four centrifugal stations under construction. Texas Eastern introduced the new centrifugal type compressor for the first time for long-range pipe line transmission under high pressures. Texas Eastern has filed an application with the Federal Power Commission for permission to install 114,000 new horsepower in compressor stations on the Inch lines in order to increase delivery capacity from the present goal of 433 million cu ft a day to 508 million cu ft.

The additional natural gas above 433 million cu ft a day would be delivered to the East Ohio Gas Company, the People's Natural Gas Company, and the New York State Natural Gas Company under options in an agreement of March 26, 1947.

• **RESERVES.**—Proved natural gas reserves in the United States on December 31, 1947, were 165.93 trillion cu ft, according to a joint report of the Committees on Reserves of the American Gas Association and the American Petroleum Institute. On December 31, 1946, natural gas reserves were 160.6 trillion cu ft. New reserves discovered in 1947 amounted to 3.41 trillion cu ft, while extension of existing fields and revisions of previous reserve estimates for these fields amounted to 7.57 trillion cu ft. These additions were partly used up by a net production of natural gas in 1947 of 5.63 trillion cu ft.

• **USE.**—Industry used 78% of the natural gas sold in 1946. Domestic consumers used 16% and commercial buildings 6%. The latter two users, however, paid 60% of the natural gas bill in 1946 because of higher rates.

• **NEW LINES.**—In addition to extensions proposed by Texas Eastern and Texas Gas Transmission, Tennessee Gas Transmission Co. hopes to increase capacity from 400 to 600 million cu ft per day in lines running to the Northeast from the Gulf Coast.

Some other new lines under construction:

Michigan-Wisconsin Pipe Line Co.—building 1,069 miles of 22-in. to 26-in. pipe, from the Mid-Continent field to Michigan and Wisconsin.

Cities Service Gas Co.—a 405-mile line of 26-in. pipe from the Mid-Continent field to Kansas City, Mo.

Some other projected lines:

Transcontinental Gas Pipe Line Co.—1,838 miles of 26-in. line from southern Texas through Louisiana, Mississippi, Alabama, Georgia, South Carolina, along the Gulf Coast and Atlantic Coast to New York. Estimated cost: $180 million.

Tennessee Gas Transmission Co.—907 miles of 26-in. and 30-in. loop lines on main line, Texas to Kentucky, and a transmission line 358 miles to Boston. Estimated cost: $150 million.

Memphis Natural Gas Co.—1,016 miles of 26-in. line from eastern Texas through Louisiana, Arkansas, Mississippi, Tennessee, Kentucky, Indiana, Ohio, and Pennsylvania. Estimated cost: $63 million.

Atlantic Gulf Gas Co., subsidiary of United Gas Corp.—1,530 miles of 26-in. line from Mississippi through Alabama, Georgia, Florida, and South Carolina. Estimated cost: $57 million.

Southern California Gas Co. and Southern Counties Gas Co.—80-mile, 8- and 6-in. tie-in to recently completed 30-in. Blythe-to-Santa Fe Springs line near Desert Center, Calif., through Imperial Valley to Holtville. Estimated cost: $3 million.

LARGE INDUSTRIAL PLANT

heated and ventilated by 10 unit systems to save floor space and reduce duct size.

Ten independently controlled and operated forced air systems are installed in the new Ashtabula, Ohio, plant of the Reliance Electric & Engineering Co., to provide a flexible heating and ventilating system. The plant, which is 480 ft long, 250 ft wide and has a floor area of 120,000 sq ft, is used for the manufacture of one to 20 hp motors.

• **AIR MOVEMENT.**—Each system has its own air inlet with louvers in the sash just below the roofline. Air is fed into a plenum chamber in which is installed a bank of 30 washable viscous type filters. From the filters, air passes to a second plenum chamber provided with ample space so that should summer cooling be considered, there will be space in this chamber for the installation of the necessary cooling coils.

Air is moved from the second plenum chamber by either of two Axivane fans of the Joy Manufacturing Co. Each fan, operated by a 5 hp Reliance single speed motor, is placed inside the duct itself, according to a design originally developed for Naval vessels. The fan is a World War II development of the La-Del Division of Joy. One fan operates during the winter to provide three air changes per hour; in summer, both fans are used to provide six air changes per hour. For winter heating, air is carried over Trane double unit heat exchangers. Plenum chambers, steam coils and fans are all mounted on a platform above the bottom chord of the roof truss, and the component parts are accessible for inspection and maintenance.

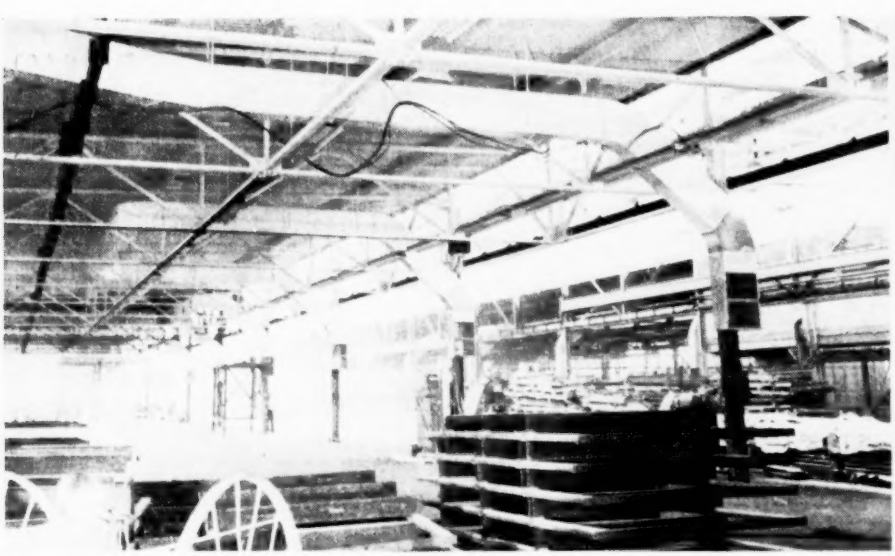
• **OUTLETS.**—Each separate system has six outlets placed 8 ft above the floor to provide uniform air distribution throughout the building. Dampers located throughout the duct work balance the air flow at each air outlet. Downcomers closest to the wall distribute air to areas about 25 by 40 ft and those on interior building columns serve areas 40 by 50 ft. Outlets on opposite walls are faced to opposite directions to maintain a continuous air circulation. Each unit system serves an area of about 80 by 125 ft. A static air pressure of 1.5 in. water gage was found to be sufficient to counteract infiltration of dust.

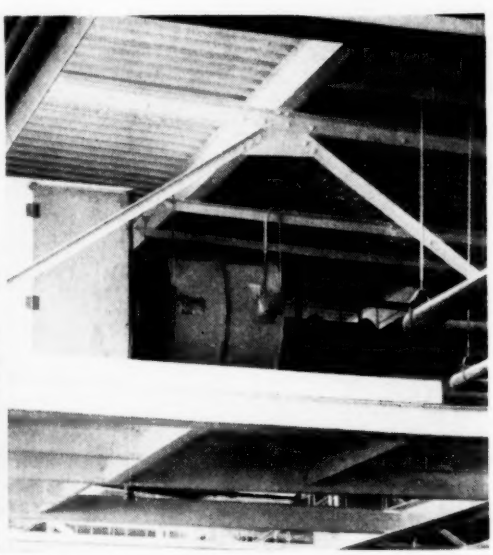
Company engineers claim that use of the ten heating and ventilating units has kept down the size of the ducts, has eliminated possible cumbersome feeder installations to get the desired air volume to all parts of the plant, and has improved plant appearance.

Natural exhaust is obtained through eight 66 in. diameter gravity type roof ventilators provided with pneumatically controlled louver dampers.

• **STEAM.**—Steam for the heat exchangers is supplied by one 200 hp and one 300 hp Cleaver Brooks flash type boilers. Steam pressure of 50 lb per sq in. at the mains is reduced to 5 lb per sq in. at each heating coil. Space is available in the boiler room for an additional boiler, when required.

• The 1947-1948 coal year ended March 31 with an estimated *commercial production of anthracite* of 54,245,000 net tons. This is a decrease of 3.3% from production of the previous coal year but an increase of 3.7% over production in 1945-1946.





Left, part of the ductwork from the ten independently controlled forced air heating and ventilating systems. Air outlets are placed at each building column. Right, One of the heating and ventilating systems installed on a platform above a chord of the roof truss. Axivane fans are installed inside ducts.

ENVIRONMENT CONTROL

is advanced as industrial health associations hold concurrent annual meetings in Boston.

Control of industrial environment for health and productivity of workers was the theme of discussions and technical papers at an interlocking series of annual meetings of five national organizations at the Hotel Statler in Boston, Mass., March 27 to April 4.

Meetings were the 33rd annual meeting of the American Association of Industrial Physicians and Surgeons; 9th annual meeting of the American Industrial Hygiene Association; 10th annual meeting of the American Conference of Governmental Industrial Hygienists; 6th annual meeting of the American Association of Industrial Nurses; and the 5th annual meeting of the American Association of Industrial Dentists.

Nearest in line with interests of heating and ventilating engineers were discussions of atmosphere contamination, radiation hazards emphasized by atomic energy development, and a symposium on heat exposure in industry. These subjects were predominant in programs of the two groups representing industrial hygienists, AIHA and ACGIH, while the physicians' organization pointed up the medical aspects of certain toxic exposures with such papers as "Recent Studies in Beryllium" by Dr. Joseph C. Aub, Harvard University. All five associations participated in a two-hour joint meeting which included the symposium on heat exposure.

• **HEAT EXPOSURE.**—This symposium consisted of reports by Dr. E. F. Adolph, University of Rochester; T. F. Hatch, Industrial Hygiene Foundation of America; and Dr. Arlie V. Boch, Harvard University. During the war, Dr. Adolph and Mr. Hatch were active in research for the armed forces concerning exposure in desert and tropical warfare. Dr. Boch has long been prominent in research on the effects of excessive heat on the body.

The ordinary thermometer does not tell how hot it really is, particularly in certain industries, said Mr. Hatch, president of AIHA. He explained that radiant heat emanating from furnaces and hot operations does not always heat the surrounding air excessively but may be imparted like rays of light to any object which it strikes, including man. The effect is one of being too hot even in the presence of cool air temperatures, as at Sun Valley. He further pointed out that industrial hygienists can solve the problem by using special types of thermometers and radiometers to measure radiant heat and by devising barriers to control it.

Experimental data on this subject were obtained through the efforts of Dr. Adolph who conducted investigations with enlisted personnel at Fort Knox. Dr. Adolph presented evidence of his findings and pointed out how they can be applied to industry. According to Dr. Adolph, it is possible actually to calculate the amount of water and salt needed when working in the heat. He reported the case of one subject who, under experimental conditions, drank 18 quarts of water in eight hours.

• **AIR HYGIENE.**—Concern of industrial hygienists with problems of air contamination was evidenced by a number of papers presented on programs of ACGIH and AIHA. The former group heard a presentation prepared by the Pennsylvania Department of Health on health hazards incident to extraction and use of beryllium; a paper originating in the Massachusetts Department of Labor and Industries on maximum allowable concentration of benzene; and committee reports on industrial ventilation, air sampling instruments, threshold limits, etc. Air hygiene papers on the program of AIHA included a series on the toxicology of various industrial solvents and reagents such as carbon disulfide, chlorinated amines, ethers, silicones, ketene, diisopropylamine, and certain antioxidants and accelerators. Other AIHA papers relating to air control problems were two prepared by the staff of the National Institute of Health, Bethesda, Md., on the influence of liquid aerosols on fine duct particles and the influence of dust on the actual pulmonary volume; a discussion of fume exposure in abrasives manufacture prepared by the Toronto Department of Health and D. R. Finlay of the Norton Co. of Canada; health hazards in railroad tunnels, by C. J. Taylor, California State Department of Public Health; the case for maximum allowable concentrations, by H. B. Elkins, Massachusetts Division of Occupational Hygiene; environmental studies in plants using beryllium, by M. Eisenbud, C. F. Berghout, and L. T. Steadman, U. S. Atomic Energy Commission; and an analysis of the nature and quantity of contaminants in the Cincinnati area by the staff of the Kettering Laboratory of Applied Physiology.

• **OFFICERS.**—Lineup of officers of AIHA for the

J. H. Sterner E. C. Barnes T. F. Hatch

1948-1949 term is: James H. Sterner, Eastman Kodak Co., president; E. C. Barnes, Westinghouse Electric Corp., president-elect; Theodore F. Hatch, Industrial Hygiene Foundation, past president; W. G. Hazard, Owens-Illinois Glass Co., secretary; and C. E. Brown, U. S. Bureau of Mines, treasurer. Permanent executive secretary of the organization is Henry F. Smyth, Jr., Mellon Institute of Industrial Research.

• **HIGH SPOT.**—Outstanding on the program of AIHA was the Cummings Memorial Lecture delivered this year by Dr. Alice Hamilton on the subject: Forty Years in the Dangerous Trades. For her presentation,

Dr. Hamilton drew on a wealth of experience gained in pioneering years of struggle against health hazards which today would be considered apallingly wasteful of manpower and productivity. Notable among her achievements was her campaign, beginning in 1911, against conditions then extant in lead mining and fabricating industries. Similarly dramatic were Dr. Hamilton's battle against silicosis in tunneling and mining operations and against mercury poisoning once rampant among hatters.

• **RADIATION.**—Heavy guns of the AIHA conference were directed at radiation hazards in industry, a symposium at which Dr. James H. Sterner, president-elect of AIHA, and Harold C. Hodge, University of Rochester, presided. Radiation hazards were described by C. R. Williams, Liberty Mutual Insurance Co., who pointed out that not only are there new and dramatic hazards incident to wartime developments in atomic fission, but similar exposures may occur wherever x-ray or fluoroscope equipment is used. Basic concepts in nuclear physics were discussed by R. C. Evans, Massachusetts Institute of Technology. Techniques of measuring radiation exposures were described by J. W. Healy, Hanford Engineering Works, while means of protection and maximum allowable exposure values were the subject of a paper by K. Z. Morgan, Oak Ridge National Laboratory.

Shell Oil's most powerful barge rig looms 225 ft over Louisiana bayou in contrast with Colonel Drake's 40-ft wooden rig (insert) on first American oil well at Titusville, Pennsylvania, drilled in 1859.

OIL SITUATION

viewed with confidence at Oil Heat Institute convention in Chicago.

There will be enough additional fuel oil this year to adequately supply 10% more power driven oil burner installations than those at present in use, according to R. S. Bohn, president of Oil Heat Institute, at the opening of the Silver Anniversary National Oil Heat Exposition and Convention. This means, he said, that about 350,000 new power driven burners can be installed this year without over-taxing oil supplies. It is also estimated that about 1,000,000 new and replacement space heaters can be handled by present and assured reserves and refining capacity.

• **RESERVES.**—Information released at the convention included the American Petroleum Institute's report on proved liquid hydrocarbon reserves, including crude oil and natural gas liquids. As of December 31, 1947, API estimates U. S. crude oil reserves at 21.5 billion barrels, while American Gas Association estimates natural gas liquids at 3.25 billion barrels. These end-of-year figures show an increase in total liquid hydrocarbon reserves of 705 million barrels over the similar figures for 1946, in spite of the drain of record production during 1947 of 201 billion barrels. These estimates include only liquids recoverable under existing economic and operating conditions.

• **REFINING CAPACITY.**—Today there are 406 oil refineries in the United States with a total capacity of 5.6 million barrels daily operating at 97.8% of capacity. This compares with the peak wartime (1945) year's daily average production of 4.7 million barrels.

• **OIL TRANSPORT.**—Biggest problem, says OHI, is transportation of petroleum products to market areas in the face of steel shortages curtailing production of tankers, pipe lines, tank cars, barges, and trucks. Here's how these facilities stood in 1947:

Pipe lines (miles)	150,000
U. S. tankers (March 1)	822
Mississippi barges (approx.)	1,450
Tank cars (Jan. 1)	159,072
Tank trucks	200,000

Despite increases, these facilities have been insufficient because of underestimates of postwar demand. An estimated total of $440 million will be spent during 1947-48 to expand transportation facilities. This amount is included in an aggregate of $4 billion to be spent by the oil industry for general expansion in that period.

• **EXHIBITION.**—Concurrent with the OHI convention was the National Oil Heat Exposition at which 131 exhibitors took space in the Chicago Coliseum. This was the largest oil heat show to date both in number of exhibitors and amount of space.

Evident as trends among the various oil burning equipment shown were new emphasis on styling, greater fuel burning efficiency, and increased attention to lines of complete, engineered, heating equipment including both burner-boiler and burner-furnace units.

INADEQUATE HEATING

for 25% of new houses because of lack of equipment predicted for 1948.

Approximately one out of every four new houses built during 1948 is going to be uninhabitable upon completion due to a lack of adequate heating equipment. This was the statement released today by George Boeddener, managing director of the National Warm Air Heating and Air Conditioning Association.

A gloomy picture for expectant new home builders, these figures are based on the results of a recent survey of manufacturers in the warm air heating industry conducted for the association by Dun & Bradstreet. The survey included reports from manufacturers of furnaces, pipe and fittings, registers, blowers, controls and filters (all components of gravity and forced warm air heating systems used in single family homes and multi-family units).

• **CAUSES.**—Direct causes of this situation are the current shortages in supplies of iron and steel which have forced cut-backs in the equipment production of a large number of manufacturers in the industry.

The forecast shortage of 200,000 home heating units is based on a housing completion program in 1948 comparable with that of 1947 when approximately 850,000 housing units were completed. In addition to the shortage of 200,000 furnace units, there will be a shortage of approximately 10,000 tons of prefabricated pipe and fittings, and undisclosed thousands of registers and blowers. The survey did not include the requirements of warm air heating dealers who design and fabricate pipe and fittings in their own shops. However, it is estimated that their requirements will approximate 120,000 tons of galvanized sheets for the remainder of 1948.

Although comparatively small tonnages of steel are used in the manufacture of temperature controls and filters, the existent steel shortages can also affect production of these important items.

• **EFFECT.**—It would appear that today's American home builder is due to go through the same difficulties experienced by his neighbors who built homes during the war years. Then, thousands of completed housing units could not be used upon completion due to a lack of heating equipment as a result of cut-backs in the production of furnaces and components effected by the former War Production Board.

"Currently, a large number of manufacturers of warm air heating equipment have had their supplies of steel and iron drastically curtailed by iron producers, steel mills and warehouses," said Mr. Boeddener. Many manufacturers have been forced to make 'gray market' purchases resulting in substantially higher costs of operation. Also, many manufacturers have been forced to drastically curtail production. One has already closed down operations entirely and others will follow unless it is possible for the industry to obtain substantially increased supplies of iron and steel at mill prices.

SMOKELESS BOILER

for residential use with bituminous coal is magazine type with gravity feed.

Bituminous Coal Research, Inc., has announced the successful application of the principles of smokeless burning of coal to residential heating boilers of new design.

BCR states that its newly developed smokeless low-pressure heating boiler fills an urgent need in the field of coal-burning equipment and that a large potential market exists for manufacturers who produce this unit with the cooperation of BCR and Battelle Memorial Institute.

• **TYPE.**—Demonstrations of a full-scale laboratory model show that the boiler will meet the requirements of even the most stringent city smoke ordinances. The boiler is inherently the magazine type and will hold enough fuel for twelve hours' operation at full output. The fuel feeds by gravity with little or no manual attention even with coking coals. Natural draft from an average chimney is sufficient to operate the boiler and automatic draft dampers can be applied to the boiler to regulate the heat release.

• **FUEL.**—A wide range of bituminous coals can be burned in the boiler without any need for special processing or selection of the coal to insure smokelessness. Both coking and free-burning coals can be used.

The boiler developed by BCR, in cooperation with manufacturers, has already fulfilled laboratory requirements and is now in the stage of engineering design. Its principles permit conversion of a conventional vertical-sectional boiler to the smokeless magazine type.

• **SIMPLE.**—Because the differences between the BCR and conventional boilers are few and simple, a manufacturer can incorporate the smokeless principles in new boiler construction without seriously changing his manufacturing procedure. This changeover entails the use of different type grates and firing door, and adding one special boiler section. The slight increase in production cost will be more than offset by more efficient combustion, smokelessness, and generally improved operating performance.

Although the successful development has been accomplished on cast-iron boilers. BCR says that practical application of the same principles can be made to new steel boilers. BCR will meet with the principal manufacturers of heating boilers in the near future to discuss commercial production of the smokeless boilers.

• Drafts of a proposed *uniform plumbing code* for housing, developed by the Housing and Home Finance Agency to facilitate the standardization and improvement of plumbing systems, particularly as to design and safety, are being sent to groups in the construction field for comment.

RIVER COAL PRODUCTION

holds million-ton yearly average as fines-burning equipment develops.

The recovery of anthracite fines from river beds by dredges is a sizable industry. The following facts have been taken from reports of the U. S. Bureau of Mines for the fifteen years 1932-1946 inclusive, the latest available. Sales of river coal held well below the million ton mark through the 1930's, but with the opening of World War II jumped to the peak of 1,515,113 tons in 1941. Since that year sales have held at slightly lower levels and in 1946 amounted to 1,127,096 tons. The average value per net ton has climbed steadily from less than one dollar in 1935 to $1.85 in 1946, when the product was valued at $2,081,292. The 541 men employed in 1946 worked 252 days.

• **STATISTICS.**—Of the total production 76% is in sizes smaller than barley. Barley accounts for 18.5%, rice 4.5%, and No. 1 buckwheat 1%. The average sales price of river coal is less than that of standard anthracite owing to its inferior preparation and lower production cost. The average differences between the reclaimed river coal and genuine anthracite in 1946 were: buckwheat, 20c; rice, $1.83; barley, $1.03; No. 4 and smaller, 32c.

The Susquehanna River is by far the largest source, having yielded 70% of the total during the past several years. The Schuylkill River has accounted for 27% and the Lehigh River 3%. The Schuylkill began gaining in importance in 1941 when it suddenly jumped from around 12% to over 25% of total river coal production.

• **CONSUMPTION.**—About one-third of river coal is consumed at locations near points of recovery, while the balance is shipped to more remote destinations. It finds its greatest use in public utility plants and industrial establishments having facilities for burning very small sizes.

River coal has been accumulating since the beginning of mining. It is impossible to estimate with any degree of accuracy the tonnage that can be recovered economically because of the difficult operating problems in connection with the movement of dredges and barges in shallow water.

Within the past few years research and improved burning equipment have opened up new markets for the smaller sizes with the result that a high percentage is now recovered at the mines and does not enter the streams, according to an Anthracite Institute bulletin.

WATER COOLED DOOR

for high temperature firebox developed by railroad employee.

A water cooled door for high temperature furnaces has been developed by Frank H. Bennett, a department superintendent of the Maine Central railroad. This particular door has been placed on a high temperature oil fired furnace in the railroad's blacksmith shop at Waterville, Me.

• **DESIGN.**—Original in design and application, the door is a hollow steel box, 40 in. long by 20 in. wide by 5 in. in depth. Welded at the edges and riveted every four inches, it resembles somewhat a section of a water jacket surrounding a locomotive firebox. Water enters the bottom through a flexible coupling and flows upward to an outlet at the top. The entire assembly is hung on pulleys and counterbalanced for ease of operation. Workmen do not have to touch the door itself. It keeps about 14 gallons of water between the firebox and the workmen. Previous doors at the shop, constructed of steel and fire brick, were completely burned out after two weeks' exposure to the intense heat of the furnace. But as temperature of the water in the door does not rise more than 10 degrees, the new door promises to outlast the furnace.

NEWS BRIEFS

• Socony-Vacuum Oil Co., Inc. has announced that additional *storage capacity for 61 million gallons* of petroleum products will be provided before October in more than 25 cities in New York state and other parts of Northeastern United States.

• Facts about *hard coal research*, long term planning, and industry promotion are contained in a progress report released by Anthracite Institute. This report for 1947 is divided into three general sections. The first outlines research and engineering accomplishments at the laboratories in Wilkes Barre, Pa. The second supplies production and marketing statistics. A final section recapitulates the institute's $650,000 advertising campaign.

•Melvin H. Baker, chairman of the Construction Industry Committee of Washington, D. C., has reported Department of Commerce figures showing that *maintenance and repair expenditures* for 1947 are estimated at $7 billion compared to $12.8 billion for total new construction. Pre-war peak year, 1941, for repair and maintenance showed expenditures of $3.9 billion.

• Printed copies of *Prefabricated Homes (Second Edition), Commercial Standards CS 125-47*, are now available, according to an announcement by the Commodity Standards Division of the National Bureau of Standards. Copies are for sale by the Superintendent of Documents, Government Printing Office, Washington 25, D. C., for ten cents each.

(More News Briefs on page 112)

DEGREE-DAYS FOR MARCH, 1948

HEATING AND VENTILATING's 21st Year of Publication of Monthly Degree-Day Data

City	March			Cumulative, Sept. 1 to Mar. 31			Heating Season[1]
	1948	1947	Normal	1947-48	1946-47	Normal	Normal
Abilene, Texas	411	469	273	2802	2663	2034	2061
Albany, New York	1029	1021	980	6565	5698	5848	6580
Albuquerque, New Mexico	746	543	527	4355	3923	3970	4298
Alpena, Michigan	1198	1197	1213	6704	6457	6873	8299*
Anaconda, Montana	1245	933	1081	6995	6949	6737	8357**
Asheville, North Carolina	473	806	555	3653	3756	3831	4232
Atlanta, Georgia	307	611	388	2760	2754	2758	2890
Atlantic City, New Jersey	716	848	806	4363	3806	4437	5176
Augusta, Georgia	207	485	273	2265	2143	2137	2161
Baker, Oregon	938	721	880	5611	5814	5904	7163
Baltimore, Maryland	562	764	701	4081	3643	4163	4533
Billings, Montana	1093	1109	955	6199	6449	6209	7119
Binghamton, New York	(a)	1052	995	(a)	5316	5960	6808
Birmingham, Alabama	290	568	260	2686	2658	2283	2352
Bismarck, North Dakota	1481	1221	1283	8320	7798	8152	9192
Block Island, Rhode Island	874	876	911	4942	4265	4678	5788
Boise, Idaho	842	624	651	5155	5164	4881	5552
Boston, Massachusetts	837	847	908	5338	4586	5230	6045
Bozeman, Montana	1231	1008	1096	7007	6709	6993	8521**
Buffalo, New York	940	1089	1032	5838	5424	5800	6822
Burlington, Vermont	1156	1076	1088	7086	6295	6584	7514
Butte, Montana	1301	999	1048	7478	7335	6683	8235**
Cairo, Illinois	497	723	539	3798	3536	3708	3909
Canton, New York	1122	1127	1160	7166	6563	7002	8020
Charles City, Iowa	1089	1078	1024	6739	6339	6752	7588
Charleston, South Carolina	187	438	242	1908	1679	1733	1769
Charlotte, North Carolina	336	640	428	3067	2879	2961	3120
Chattanooga, Tennessee	346	684	415	3126	3252	2974	3118
Cheyenne, Wyoming	1155	1056	995	6378	6239	6174	7466
Chicago, Illinois	857	981	845	5373	5095	5246	6077
Cincinnati, Ohio	556	839	676	4257	4024	4351	4684
Cleveland, Ohio	813	1025	930	5384	5023	5371	6155
Columbia, Missouri	724	880	694	4570	4397	4597	4922
Columbia, South Carolina	242	532	301	2448	2237	2301	2364
Columbus, Ohio	648	943	778	4827	4610	4891	5398
Concord, New Hampshire	1050	1040	1011	6854	6126	6332	7353
Concordia, Kansas	960	881	735	5220	4894	4908	5315
Dallas, Texas	380	465	267	2657	2370	2247	2256
Davenport, Iowa	885	972	893	5660	5312	5718	6289
Dayton, Ohio	739	1013	744	5257	4957	4787	5264
Deer Lodge, Montana	1192	894	1056	6896	6605	7125	8672**
Denver, Colorado	968	853	800	5214	5017	5073	5874
Des Moines, Iowa	993	998	890	5833	5588	5825	6384
Detroit, Michigan	932	1058	973	5798	5319	5691	6490
Devils Lake, North Dakota	1551	1353	1323	8962	8572	8694	9970
Dodge City, Kansas	965	819	688	5098	4651	4646	5035
Dubuque, Iowa	971	1024	958	6114	5768	6152	6790
Duluth, Minnesota	1298	1257	1265	8156	7875	7945	9483
Eastport, Maine	1151	994	1110	6624	5965	6612	8520**
Elkins, West Virgina	624	1065	763	5036	5082	5019	5697
El Paso, Texas	444	307	282	2861	2559	2383	2428
Ely, Nevada	1198	851	(a)	6573	6286	(a)	(a)
Erie, Pennsylvania	863	1035	973	5289	4912	5407	6273
Escanaba, Michigan	1284	1177	1262	7166	6833	7290	8771
Evansville, Indiana	568	869	620	4401	4220	3968	4244
Fort Smith, Arkansas	505	619	397	3356	3159	3054	3147
Fort Wayne, Indiana	860	1055	818	5735	5410	5321	5925
Fort Worth, Texas	403	478	217	2682	2409	2121	2148
Fresno, California	370	196	316	2371	2466	2199	2334
Galveston, Texas	176	270	78	1438	1389	1016	1016
Grand Junction, Colorado	911	646	672	5507	5150	5046	5548
Grand Rapids, Michigan	940	1052	964	5747	5402	5827	6535
Green Bay, Wisconsin	1168	1102	1125	7017	6536	6903	7825
Greensboro, North Carolina	411	765	474	3630	3505	3319	3529
Greenville, South Carolina	352	657	446	3054	2936	3185	3380
Harrisburg, Pennsylvania	681	878	803	5146	4517	4880	5375
Hartford, Connecticut	890	909	887	5809	4979	5303	6036
Hatteras, North Carolina	301	563	465	2285	2046	2316	2571
Havre, Montana	1246	1346	1169	6884	7725	7557	8700
Helena, Montana	1203	1009	1004	6817	6923	6615	7894**
Houston, Texas	191	267	65	1549	1456	1157	1157
Huron, South Dakota	1170	1123	1092	7489	6915	1092	8004
Indianapolis, Indiana	683	944	756	4868	4592	4855	5298
Jackson, Mississippi	234	434	(a)	2251	2180	(a)	(a)
Kansas City, Missouri	788	848	691	4734	4400	4644	4956
Knoxville, Tennessee	360	738	496	3297	3451	3460	3670
La Crosse, Wisconsin	1112	1107	1033	7118	6586	6611	7322
Lander, Wyoming	1192	980	1028	6700	6711	6694	7947
Lansing, Michigan	989	1119	1035	6224	5749	6237	7048

(a) Data not available.

[1]Figures in this column are normal totals for a complete heating season, September to June, incl.

Figures in this table, with eight exceptions, based on local weather bureau reports. Exceptions are Utica, Lewiston, Sioux City, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y.; Norman E. Ross, Bursar, Bates College, Lewiston, Me.; and Alfred R. Wagstaff, Engineer, Sioux City Foundry and Boiler Co., Sioux City, Iowa, respectively; Anaconda, Bozeman, Butte, Deer Lodge and Livingston, Mont., through the courtesy of the Montana Power Company.

[Table concluded on Page 104]

Degree-Days for March, 1948 (Concluded)

HEATING AND VENTILATING's 21st Year of Publication of Monthly Degree-Day Data

City	March			Cumulative, Sept. 1 to Mar. 31			Heating Season[1]
	1948	1947	Normal	1947-48	1946-47	Normal	Normal
Lewiston, Maine	1051	991	1093	6661	6208	6625	7707
Lincoln, Nebraska	979	902	840	5652	5184	5483	5999
Little Rock, Arkansas	431	599	353	3155	2960	2733	2811
Livingston, Montana	1137	1037	967	6357	6471	5985	7245**
Los Angeles, California	302	169	159	1286	1140	1255	1504
Louisville, Kentucky	512	817	589	4072	3898	3916	4180
Lynchburg, Virginia	492	825	564	3965	3806	3707	3980
Macon, Georgia	226	482	260	2303	2225	2168	2201
Madison, Wisconsin	1079	1070	1054	6691	6141	6611	7429
Marquette, Michigan	1238	1188	1249	7091	6797	7164	8693*
Memphis, Tennessee	424	619	384	3263	3008	2854	2950
Meridian, Mississippi	233	463	245	2290	2267	2136	2160
Milwaukee, Wisconsin	1029	1085	1023	6260	6031	6208	7245
Minneapolis, Minnesota	1168	1122	1094	7326	6844	7044	7850
Modena, Utah	(a)	722	827	(a)	5384	5591	6562
Montgomery, Alabama	197	417	208	1994	1921	1884	1884
Nantucket, Massachusetts	860	892	899	5121	4469	4811	5957
Nashville, Tennessee	405	733	477	3511	3407	3327	3507
New Haven, Connecticut	878	914	899	5489	4763	5129	5895
New Orleans, Louisiana	110	249	59	1363	1216	1024	1024
New York, New York	714	851	771	4699	4164	4608	5274***
Nome, Alaska†	1867	1430	1660	9012	8999	8886	14580**
Norfolk, Virginia	415	693	521	3094	2793	3104	3350
North Head, Washington	652	507	623	3654	3736	3755	5452**
North Platte, Nebraska	1022	940	875	5643	5555	5681	6366
Oakland, California	466	296	363	2542	2522	2392	3143**
Oklahoma City, Oklahoma	639	596	465	3721	3326	3451	3613
Omaha, Nebraska	1023	952	868	5831	5433	5633	6131
Oswego, New York	987	1049	1060	6005	5478	5993	7088
Parkersburg, West Virginia	533	896	670	4383	4203	4371	4775
Peoria, Illinois	857	1005	862	5502	5302	5535	6109
Philadelphia, Pennsylvania	638	808	685	4409	3886	4227	4737***
Phoenix, Arizona	256	82	152	1633	1257	1405	1405
Pittsburgh, Pennsylvania	659	1008	787	4918	4776	4734	5235
Pocatello, Idaho	1002	754	843	5991	5791	5696	6655
Portland, Maine	(a)	1010	1017	(a)	5992	6105	7218
Portland, Oregon	585	402	558	3427	3427	3732	4469
Providence, Rhode Island	793	822	890	5187	4480	5206	6015
Pueblo, Colorado	1026	830	732	5531	5196	4872	5514
Raleigh, North Carolina	352	664	446	3215	2920	3051	3234
Rapid City, South Dakota	1108	1198	1010	(a)	6583	6150	7118
Reading, Pennsylvania	655	848	794	4751	4288	4876	5389
Red Bluff, California	477	269	(a)	2592	2427	(a)	(a)
Reno, Nevada	886	675	753	5176	4867	4902	5892
Richmond, Virginia	451	727	543	3653	3303	3449	3695
Rochester, New York	958	1086	1029	6003	5498	5854	6732
Roseburg, Oregon	595	441	546	3548	3624	3636	4428
Roswell, New Mexico	609	452	428	3816	3224	3304	3484
Sacramento, California	436	277	357	2524	2524	2393	2653
St. Joseph, Missouri	889	886	682	5189	4717	4803	5161
St. Louis, Missouri	645	862	657	4353	4099	4309	4585
Salt Lake City, Utah	911	629	722	5284	5129	4866	5555
San Antonio, Texas	234	297	74	1839	1783	1202	1202
San Diego, California	283	143	251	1388	1193	1350	1645
Sandusky, Ohio	849	998	1034	5345	4890	5350	6208
San Francisco, California	412	278	353	2111	2177	2123	3264**
Sault Ste. Marie, Michigan	1336	1286	1314	7623	7313	7629	9285**
Savannah, Georgia	153	399	167	1710	1554	1490	1490
Scranton, Pennsylvania	807	991	893	5564	5044	5445	6129
Seattle, Washington	611	462	620	3654	3704	3917	4934**
Sheridan, Wyoming	1126	1153	1048	6541	6651	6837	8008
Shreveport, Louisiana	293	428	202	2427	2224	1938	1938
Sioux City, Iowa	1066	1044	967	6386	6261	6245	6898
Spokane, Washington	890	703	778	5702	5542	5485	6355
Springfie'd, Illinois	725	906	760	4818	4674	4951	5373
Springfield, Missouri	719	850	626	4420	4264	4149	4428
Syracuse, New York	990	1058	1004	6202	5588	5984	6893
Tacoma, Washington	663	514	648	3967	4001	4086	5181**
Terre Haute, Indiana	696	944	663	5010	4559	4539	4872
Toledo, Ohio	900	1047	905	5786	5323	5372	6077
Topeka, Kansas	819	833	682	4839	4496	4635	4969
Trenton, New Jersey	680	839	735	4756	4184	4450	4933
Utica, New York	1018	1062	989	6428	5129	5955	6796
Valentine, Nebraska	1118	1103	980	6327	6305	6205	7039
Walla Walla, Washington	(a)	442	598	(a)	4215	4774	4808
Washington, D. C.	522	769	694	4026	3660	4253	4626
Wichita, Kansas	781	787	648	4561	4261	4421	4673
Williston, North Dakota	1405	1311	1280	7946	8033	8238	9323
Winnemucca, Nevada	903	654	767	5405	5177	5411	6427**
Yakima, Washington	759	551	620	5033	5057	5053	5599

(a) Data not available.
†Nome data are for February.

*Includes August.
**Includes July and August.
***New 48-year normal covering 1898 to 1946.

[1]Figures in this column are normal totals for a complete heating season, September to June, incl.

FOR RADIANT PANEL HEATING

TROUBLE ALWAYS COSTS MORE THAN

REVERE COPPER WATER TUBE

FROM the beginning of the installation throughout a lifetime of continuous service, Revere Copper Water Tube is ideal for radiant panel heating.

Revere Copper Water Tube speeds installation because the 60-foot coils eliminate many joints. Where joints are needed, they are quickly made with solder type fittings. You can bend this tube readily by hand, using simple wood templates to provide the proper radius and spacing. And you can handle it easily because of its relatively light weight.

In radiant panel heating, just as in water supply and other types of heating systems, *trouble always costs more than Revere Copper Water Tube.* The permanently smooth interior of this tube reduces frictional resistance to a minimum. It is highly resistant to corrosion attack from water in the heating system; hence rust accumulation is eliminated. And the coefficient of expansion of Revere Copper Water Tube is almost identical with that of plaster, which is an important advantage in wall and ceiling installations.

It will also pay you to install such other long-lived Revere materials as Red-Brass Pipe; Sheet Copper and Herculoy for tanks, ducts, pans and trays; Dryseal Copper Refrigeration Tube (dehydrated and sealed); Copper oil burner, heat control and capillary tubes.

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Abstracts AND Reviews

Publications abstracted in this department should be ordered direct from publisher.

PREFABRICATED HOUSES

An important publication to those in the building field is the Manual on Wood Construction for Prefabricated Houses, prepared by the Forest Products Laboratory, Madison, Wis., in collaboration with the technical staff of the Housing and Home Finance Agency, Washington, D. C.

This book is based upon the accumulation of engineering studies and investigation by the Forest Products Laboratory during the past 36 years, supplemented by a recent survey of current fabrication methods at prefabrication plants in the United States.

The present demand for low-cost housing has given emphasis to the development of prefabrication of buildings. Since wood and wood products play an important part in the list of building materials, it is important to have a comprehensive guide on construction techniques for wood prefabrication.

While this manual which covers a wide range of basic information, contains a great deal of data that is already known, it also presents the results of extensive tests and studies in wood handling and processing by the laboratory. The manual should be helpful to house designers, engineers, builders, contractors and building officials interested in wood prefabricated houses.

Manual on Wood Construction for Prefabricated Houses. Paper bound, 8 x 10 in., 330 pages. For sale by Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Price, $1.50.

ELEMENTARY THERMODYNAMICS

Primarily intended as a textbook for short courses in thermodynamics, V. M. Faires, Professor of Mechanical Engineering, Agricultural and Mechanical College of Texas, has assembled a book that is concise in its presentation of the various divisions of this broad subject. It differs in the more complete books on thermodynamics in that it covers fewer topics.

The first edition was published in 1938. In this second edition, ten years later, nearly all of the original problems have been revised or replaced. A short discussion has been added on the gas turbine.

The material is divided into 13 chapters as follows: The general energy equation; characteristic equation of a perfect gas; energy equations of a perfect gas; reversible non-flow processes of gases; the Carnot and Ericsson cycles; cycles for internal combustion engines; compression and expansion of air; liquids and vapors; processes of vapors; vapor cycles; refrigeration; flow in nozzles; and mixtures.

Bound in the book are a large Mollier diagram and a General Electric psychrometric chart.

Elementary Thermodynamics, by V. M. Faires. Cloth bound, 6 x 9 in., 259 pages. Published by The Macmillan Co., 60 5th Ave., New York. Price, $4.40.

• • •

HONYCOMB-CORE SANDWICH PANELS—Development details and properties of honeycomb-core sandwich panels, a product of post-war research in housing materials and construction techniques, are explained in Technical Paper No. 7 on Physical Properties and Fabrication Details of Experimental Honeycomb-Core Sandwich House Panels. Honeycomb-core sandwich panels were developed in World War II for use in aircraft, and since these panels are considered to have good insulating qualities and strength, they are believed to be adaptable to home construction. The report describes the design, panel fabrication and some of the physical properties of the sandwich panels, as well as construction methods in building and experimental outdoor test house erected by the Forest Products Laboratory at Madison, Wis. Housing and Home Finance Agency, Office of the Administrator, Technical Staff, Washington 25, D. C.

OVERFIRE JETS FOR SMOKE ABATEMENT—An illustrated booklet on Overfire Jets in Action for Smoke Abatement explains how the use of steam jets along the lines developed by Battelle Memorial Institute can prevent smoke from commercial and industrial furnaces. Overfire air for the jets may be supplied by motor driven blowers, or the air flow can be induced by steam jets. For a copy write to Bituminous Coal Research, Inc., 912 Oliver Bldg., Pittsburgh 22, Pa.

TURBINES, CONDENSERS AND THEIR AUXILIARIES—A report by a subcommittee of the Prime Movers Committee, Edison Electric Institute which contains statements by operating companies and manufacturers. This 1945-6 report of 45 pages covers turbines, turbine operating and outage data for 1944 and 1945, and committee statements regarding condensers and auxiliaries. It contains many tables of operating data. Edison Electric Institute, 420 Lexington Ave., New York 17, N. Y. Price to non-members, $2.50.

COAL RESEARCH—The Bureau of Mines has released a report covering German coal research and fuel technology in six laboratories of the Reich observed by a special mission shortly after World War II. H. H. Lowrey, director, Coal Research Laboratory, Carnegie Institute of Technology and H. J. Rose, vice-president

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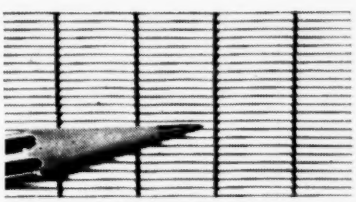

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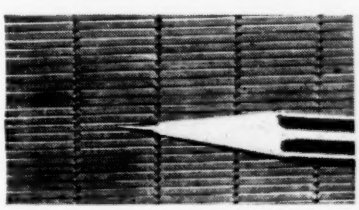

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and director, Bituminous Coal Research, Inc., have brought together in one report the important facts in a number of reports they prepared for the Combined Intelligence Objectives Subcommittee. For a free copy of Circular 7422, Some Observations on German Coal Research and Developments, write Bureau of Mines, 4800 Forbes St., Pittsburgh 13, Pa.

SMOKELESS FURNACE—Bulletin 370 on The Illinois Smokeless Furnace, by Julian R. Fellows, A. P. Kratz and Seichi Konzo explains the operating principles of this type of furnace and discusses results of tests made at the Engineering Experiment Station, University of Illinois, and the Warm Air Research Residence. Some topics covered in the bulletin are: Burning characteristics obtained with different solid fuels; effect of draft on furnace performance; smoke density; studies of five methods of controlling dampers; hold-fire operation; firing periods and temperature control. For a copy of the bulletin, write to Engineering Experiment Station, University of Illinois, Urbana, Ill.

BOILER AUXILIARIES—Report of the Boiler Auxiliaries Subcommittee of the Prime Movers Committee, Edison Electric Institute. It contains statements of the subcommittee, operating companies, and manufacturers covering operating and design problems related to boiler auxiliaries of particular concern to operators of steam generating equipment. In this 26-page publication are sections on induced draft fan wheel and housing life, induced draft fan design conditions, variable speed drives, boiler feed pumps, coal handling, boiler feed water regulation. Edison Electric Institute, 420 Lexington Ave., New York 17, N. Y. Price to non-members, $1.75; to members, 70 cents.

GAS CALORIMETER TABLES—This publication, NBS Circular C464, includes instruction for use of the water flow calorimeter in measuring the heating value of fuel gases and contains tables required for the necessary calculations and direction for their application. The present circular is a revision of NBS Circular C417. In Circular C464 there has been some change in notation and in the method of deriving equations for humidity corrections. The revision includes some new data. Price, 15 cents. Superintendent of Documents, Government Printing Office, Washington 25, D. C.

AIR CONDITIONED CRANE CABS—B. R. Small, engineer, Aluminum Company of America, is the author of a 24-page booklet covering heat alleviation of crane cabs as well as removing irritating dust and fumes to which the crane operators are subjected. After describing the types of cab enclosures recommended, the report lists the requirements of cab conditioning, such as the degree of cooling, the kind of conditioner, and the amount of air purification necessary. A chapter is devoted to refrigeration units and another to evaporative cooling. Price, 50 cents. Industrial Hygiene Foundation, 4400 5th Ave., Pittsburgh 13, Pa.

NEW CATALOGS

Steam and Water Mixer

A new steam and water mixer to provide hot water at isolated points, described in Catalog 900, eliminates piping of hot water long distances or installing separate heaters in remote wash rooms or showers; takes up little space and delivers hot water at any predetermined temperature. In two colors, the cut-away photographs show operation, installation, and construction. Convenient capacity and dimension tables are included.—*Sarco Co., Inc., Empire State Bldg., New York 1, N. Y.* **71**

Fans

A 32-page Emerson-Electric master fan catalog, Unit X6049, illustrates in color and describes a new complete line of 1948 fans with design and construction specifications, performance data on the various types of desk and stand fans, air circulators, ceiling fans, kitchen ventilators, exhaust and cooler fans.—*Emerson-Electric Mfg. Co., St. Louis 21, Mo.* **72**

Y-Type Pipe Strainers

Bulletin 184, describing ½-in. to 2-in. cast semi-steel Y-Type pipe strainers for steam, gas, air, water and oil lines gives detailed information on strainers with either perforated brass screens or fine mesh woven stainless steel screens. — *Armstrong Machine Works, Three Rivers, Mich.* **73**

Freon Refrigerants

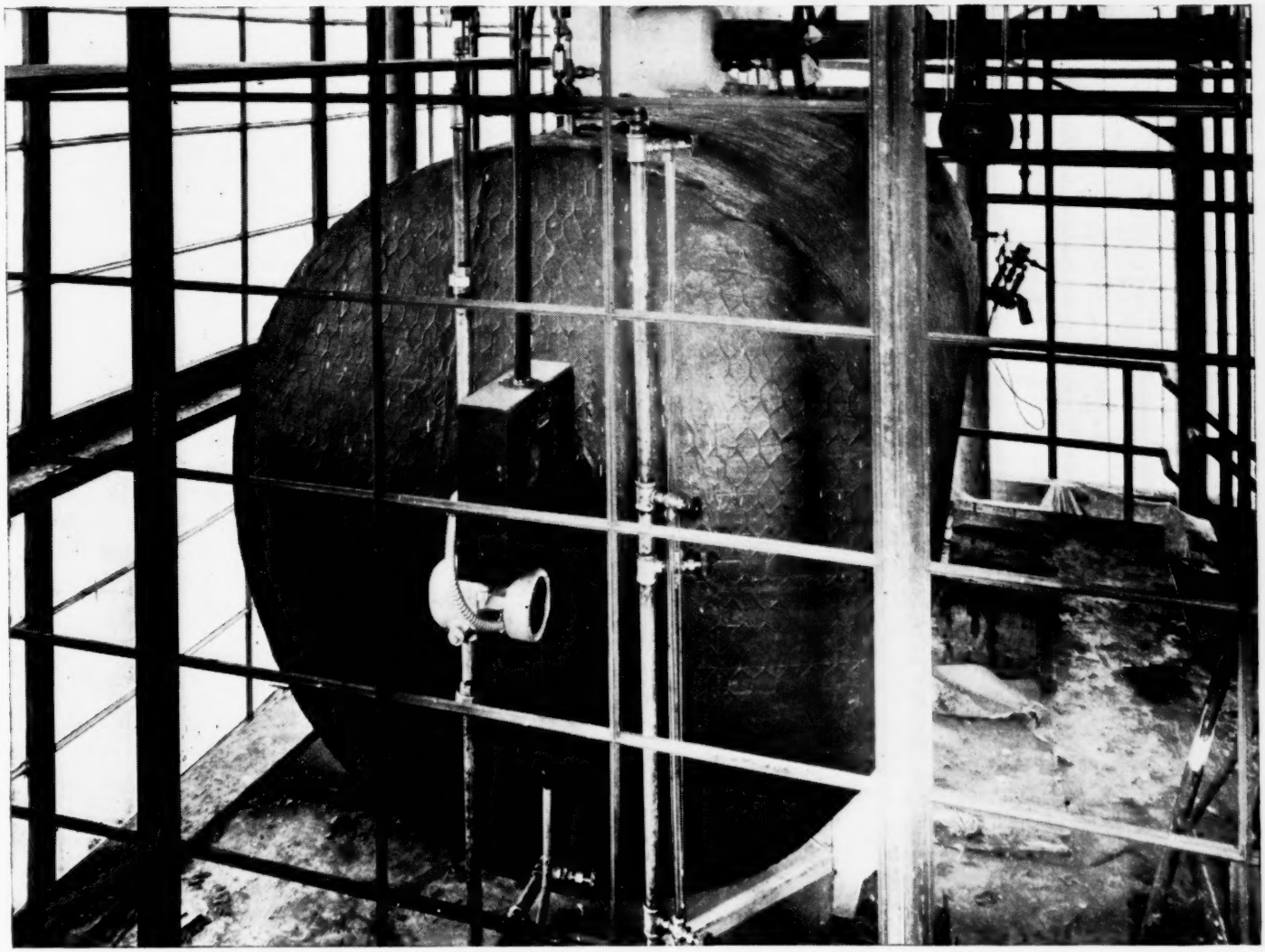
A 12-page bulletin describes the manufacturing processes and laboratory techniques involved in the manufacture, purification, and inspection of Freon refrigerants. — *Kinetic Chemicals Inc., Tenth and Market Streets, Wilmington 98, Del.* **74**

Steel Boilers

A 12-page catalog describes and illustrates the Fitzgibbons "D" Type steel boiler for use with oil, gas and mechanical stoker firing in sizes from 2,680 to 42,500 sq ft steam and for hand fired anthracite and bituminous from 2,200 to 35,000 sq ft steam. All boilers are designed and constructed in accordance with ASME standards, and rated according to the Steel Boiler Institute Rating Code. The catalog includes a discussion on the essential factors in boiler selection in relation to this Code.—*Fitzgibbons Boiler Co., Inc., 101 Park Avenue, New York 17, N. Y.* **75**

Blower Wheels

Bulletin 100 describes Revcor centrifugal blower wheels with dimension and capacity tables, construction diagrams and performance graphs.—*Revcor, 3227 W. Carroll Ave., Chicago 24, Ill.* **76**



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It's Fiberglas-insulated—to confine working BTU's where they'll do a useful, fuel-saving job.

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The high thermal insulating efficiency of Fiberglas results from the countless tiny air spaces enclosed in a lightweight, wool-like blanket of long, fine fibers of glass. Here is a material that will not burn, rot or decay—is non-corrosive and will not corrode metals. Fiberglas insulation holds together, is resilient, will not settle under vibration.

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Get all the facts about Fiberglas blankets—their many forms and uses. Write for "Fiberglas Insulations for Industry" . . . Owens-Corning Fiberglas Corporation, Dept. 912, Toledo 1, Ohio. Branches in principal cities.

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Air Vent Valves

A 12-page catalog describes and illustrates the Dole line of air valves for steam and hot water heating systems. A valve selection chart is included. Section 2 of the catalog describes the Dole water mixer.—*The Dole Valve Co., 1933 Carroll Ave., Chicago 12, Ill.* 77

Floor Furnaces

An 8-page, 2-color bulletin describes the Rheem series 1600 floor furnaces and dual register wall furnaces. Capacities range from 17,500 to 35,000 Btu per hr.—*Rheem Manufacturing Co., 570 Lexington Ave., New York 22, N. Y.* 78

Kitchen Ventilation

A 16-page, 2-color bulletin presents consumer's information on kitchen ventilation and describes Ilg electric ventilators for residential use.—*Ilg Electric Ventilating Co., 2850 North Crawford Ave., Chicago 41, Ill.* 79

Condensation Pump

The new model HS condensation pump with steel receiver, mounted on steel base, is described in Bulletin No. 14-A with dimension diagrams and tables of engineering data. — *Skidmore Corporation, St. Joseph, Mich.* 80

Cooling Equipment

Marlo heat transfer equipment, unit coolers, industrial coolers, evaporative condensers, air conditioning units, cooling towers, and coils are described in a 12-page illustrated bulletin.—*Marlo Coil Company, St. Louis 12, Mo.* 81

Humidity Control

An 8-page bulletin describes operation, installation, and physical data of the Kathabar system of winter and summer humidity control.—*Surface Combustion Corp., Toledo 1, Ohio.* 82

Plumbing Fittings Price List

The 1948 price list of the Universal Plumbing Sales Co., 16 pages, is said to be the first complete compilation of all the standard list prices applying to plumbing fittings of all kinds.—*Universal Plumbing Sales Company, 1209-1217 DeKalb Avenue, Brooklyn 21, N. Y.* 83

Radiant Heating Laboratory

A new testing laboratory for products used in radiant heating installations, available for use of manufacturers, is described in an 8-page illustrated bulletin.—*Pan-L Heat Corp., 2838 N.E. Columbia Blvd., Portland 11, Ore.* 84

Electric Motors

Fractional horsepower models in the new line of Torq motors are described in a 4-page bulletin. Types included are high load capacity, capacitor start, and polyphase motors. Ratings include 1/6, 1/4, 1/3 and 1/2 hp. Exclusive features are the new Syncrosnap starting switch and the Temprotex thermostatic overload protector.—*Torq Electric Corporation, Bedford, Ohio.* 85

Dust Collector System

An illustrated bulletin entitled "Optimum Recovery with the Mikro-Collector" describes features of the new dust collector. Special emphasis is placed on the ability of this equipment to handle even damp and hitherto baffling dust loads. Filter rates, dimensions, weights, and other details are covered in this bulletin.—*Pulverizing Machinery Co., 194 Chatham Road, Summit, N. J.* 86

Pumps

Burks condensation return units and industrial pumps are described and illustrated in catalog No. 67, 37 pages, 3 colors. Selection tables, dimension prints, and photographs are supplemented by a section on general engineering information, including tables of equivalent pressures, friction in pipes, etc.—*Decatur Pump Co., Decatur, Ill.* 87

Pneumatic Control Valves

Pneumatic control valves and controller accessories are described and illustrated in a 36-page catalog, Bulletin 277-2. Three general types of air-operated control valves are described and selection data are included. Special types include diaphragm motor levers, air switches, remote valve control systems, etc.—*The Foxboro Co., Foxboro, Mass.* 88

MAY, 1948

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Editor, HEATING AND VENTILATING,
148 Lafayette Street, New York 13, N. Y.

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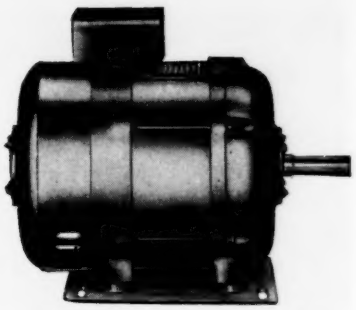
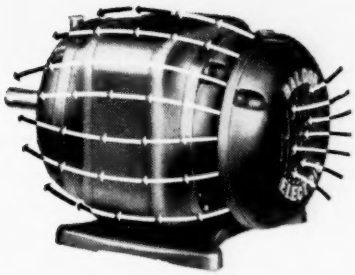


Open, drip-proof construction; 1/6 to ⅓ h. p., 1 phase, 3 phase and Direct Current.



Arrows indicate forced air-movement over ENTIRE EXTERIOR of BALDOR STREAMCOOLED Motor.

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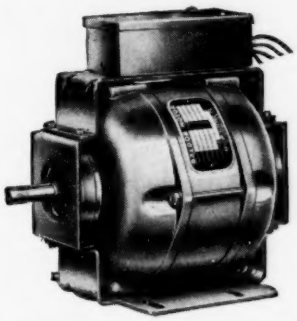

Resilient-mounted, open, drip-proof, for belt drive; 1/10 to ¾ h. p., single phase.

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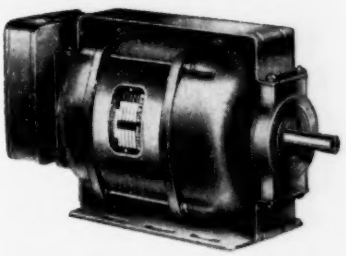
BETTER MOTORS
FOR MORE THAN A QUARTER CENTURY



Resilient-mounted fan motor, 1/30 to ½ h. p., 1 phase; ⅛ to ½ h. p., 3 phase.

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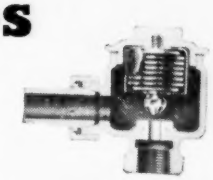

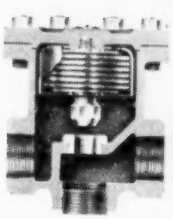

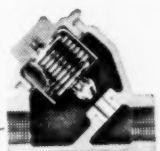

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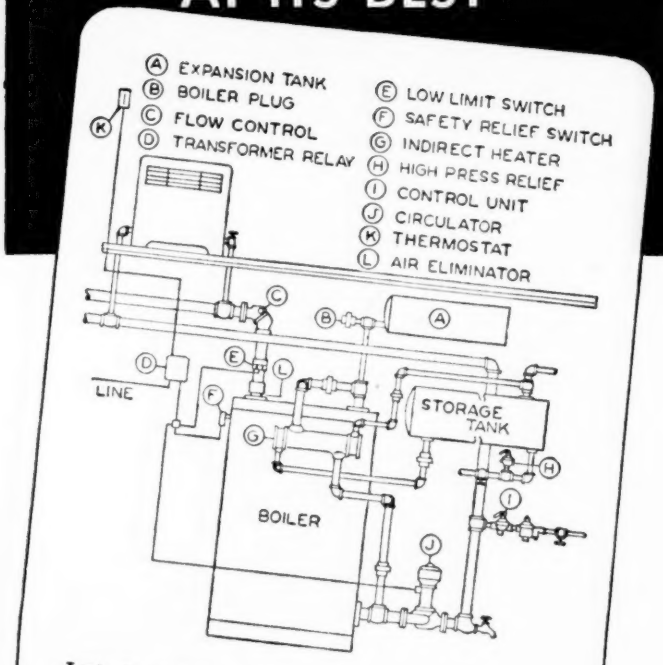

Typical installation diagram of Triplex flow controlled, two-pipe up-feed hot water heating system with indirect domestic hot water.

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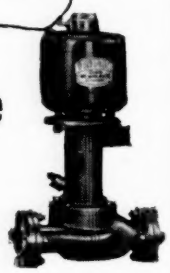
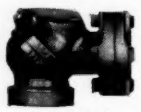
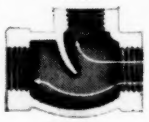
If you really want to profit from the rapidly growing demand for hot water heating, sell Triplex Flow Control Systems, too. The same Triplex units that assure *hot water at its best* in homes can also be applied to large installations by merely increasing the number or size of individual operating units. Hot water is automatically circulated—abundant heat supplied the radiators instantly, whenever and wherever needed. Thanks to complete standardization, advanced design and precision construction of all Triplex products, installations can be made quickly and easily. Best of all, operation is so trouble-free and dependable that service calls are few and far between. Yes, *Triplex means hot water at its best* . . . for everyone concerned. Push it for conversions as well as new installations. You'll win both ways. Write today for latest catalog.


Direct Drive Circulators


Flow Control Valves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NEWS BRIEFS

(Continued from page 102)

• *Shipments of complete air conditioning* equipment and components and accessories for air conditioning and commercial refrigeration equipment were valued at $43.2 million during the fourth quarter of 1947, according to the Bureau of Census, Department of Commerce. This figure showed practically no change from the $43.9 million shipped during the third quarter of that year.

• Details are now complete for the second *short course in hot water and steam heating* sponsored jointly by the Institute of Boiler and Radiator Manufacturers and the University of Illinois. The course will be given June 15, 16, and 17 at the University in Champaign-Urbana, Ill.

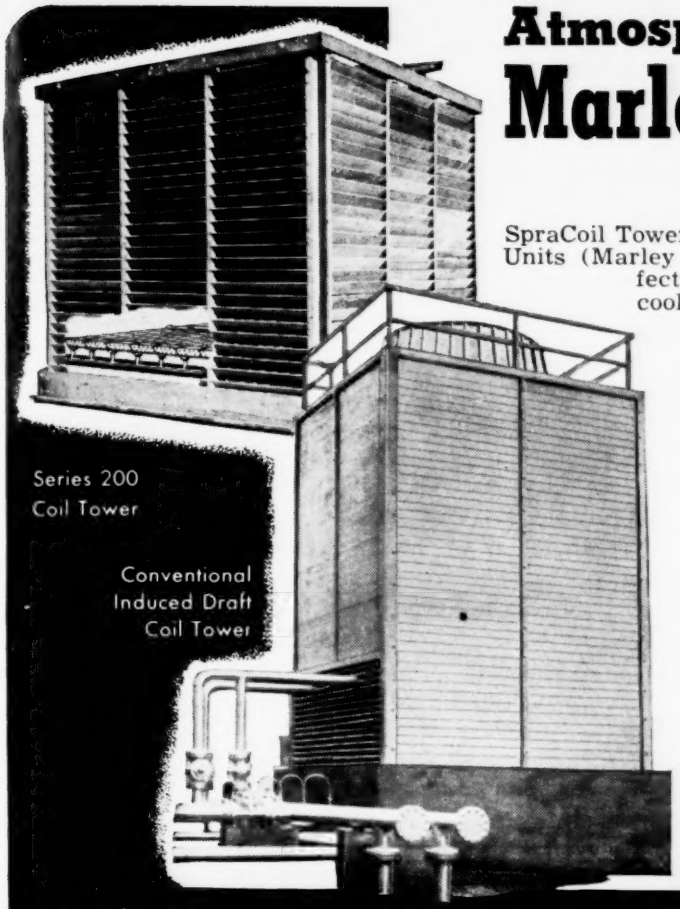
• It has been made known a merger of the *synthetic fuel program* of Cities Service with that of the M. W. Kellogg Co., petroleum engineers, has been quietly in effect since 1946 and that Kellogg is now prepared to license synthetic fuel plants on behalf of both companies for conversion of natural gas to liquid fuels.

• The generally *high production rate of construction materials* achieved during 1947 has carried over into 1948, according to the Department of Commerce monthly index of production. The seasonally adjusted index declined only 2% in January, while nine of the 20 materials included in the index recorded higher production in January than in December, 1947. Several of these nine were materials which recently have been considered in tight supply, including gypsum board, gypsum lath, cast iron radiation, soil pipe and fittings, nails and hardwood flooring.

• The campus of the University of North Dakota at Grand Forks, has been chosen as the site for the Bureau of Mines' new $750,000 *lignite research laboratory* for the study of the mining, preparation, and use of lignite.

• President Truman has signed into law the bill (HR2161) authorizing a *three-year extension* of the present program for development of *synthetic fuels*, chiefly from coal and oil shale. The bill authorizes an appropriation of $30 million, of which $1 million may be spent for research in obtaining petroleum from depleted fields.

• Devoted exclusively to the fabrication of panel boards for automatic combustion control and instruments and controllers used in process plants, a *new manufacturing building* was dedicated by *The Hays Corp.*, at ceremonies held March 18, at the Michigan City, Ind., plant.



Atmospheric and Induced Draft
Marley SpraCoil Towers

FOR CLOSED SYSTEM COOLING OF LIQUIDS, OILS AND GASES

SpraCoil Towers are the logical combination of two service-tested Marley Units (Marley Towers and Marley atmospheric sections) into one perfectly coordinated installation. For indirect and combination cooling, SpraCoil Towers set performance standards in a wide range of plants. For years they have rendered the ultimate in service for:

DIESEL PLANTS — Cooling jacket water and lube oil.

CHEMICAL AND FOOD PROCESSING — General process cooling.

DAIRIES — Cooling milk.

REFINERIES — Cooling or condensing oil, water and volatiles.

FOUNDRIES — Cooling quenching oils.

. . . also in . . .

Recycling and Natural Gasoline Plants, Compressor Stations, Smelters and Mines

The Marley Double-Flow Tower with the Marley coil shed also is adapted to high-efficiency coil cooling for largest installations.

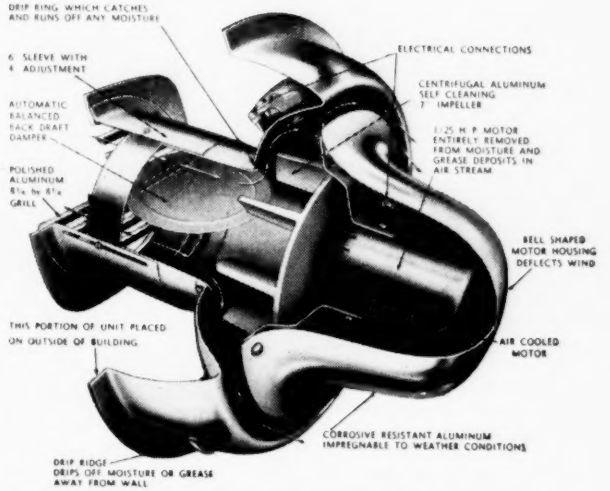
THE MARLEY WAY is the PERFECT SPRAY

Marley Non-Clog Spray nozzles boost efficiency in any cooling unit. For peak performance modernize present equipment with these patented nozzles.

MARLEY COOLING TOWERS

THE MARLEY COMPANY, INC. • KANSAS CITY 15, KANSAS

DON'T TAKE OUR WORD FOR IT!
KITCHEN-AIRE ventilating fan


DRIP RING WHICH CATCHES AND RUNS OFF ANY MOISTURE
6" SLEEVE WITH 4 ADJUSTMENT
AUTOMATIC BALANCED BACK DRAFT DAMPER
POLISHED ALUMINUM 8¼" by 8¼" GRILL
ELECTRICAL CONNECTIONS
CENTRIFUGAL ALUMINUM SELF CLEANING 7" IMPELLER
1/25 H.P. MOTOR ENTIRELY REMOVED FROM MOISTURE AND GREASE DEPOSITS IN AIR STREAM
BELL SHAPED MOTOR HOUSING DEFLECTS WIND
AIR COOLED MOTOR
THIS PORTION OF UNIT PLACED ON OUTSIDE OF BUILDING
CORROSIVE RESISTANT ALUMINUM IMPREGNABLE TO WEATHER CONDITIONS
DRIP RIDGE DRIPS OFF MOISTURE OR GREASE AWAY FROM WALL

H. E. Honderich, Indianapolis contractor, says:

"Sure, I like the Kitchen-Aire. It's the best ventilating fan I've ever used. The heavy-duty aluminum impeller really moves the air. Motor is out of air-stream, no chance of becoming a fire hazard. Outside mount of operating unit, in fully protected housing, minimizes motor noises and vibration."

"Easy as pie to install. Only 6" opening needed, easy to wire and mount. Readily available 6" duct permits installation in wall or ceiling above the range for maximum ventilating efficiency. Patented back-draft damper is protection against heat loss and wind."

"Intake grill of polished aluminum matches any color. The most advanced engineering design, at a cost LESS than fans not as good."

WRITE FOR PRICES AND LITERATURE

STEWART MANUFACTURING CO.

3208 E. Washington St. Indianapolis 1, Indiana

Draft Gages in PRACTICAL, CONVENIENT and Economical SIZES

HAYS offers a complete line of pointer type draft gages designed to fit every need and every budget.

No longer is it necessary to buy a large gage when a small one is available that will serve quite as well or better. No longer need you try to make one size gage handle all drafts.

All these gages have the famous Hays slack diaphragm unit for ranges of draft or pressure from 0 to 120 inches of water. For ranges above 100 inches, Bourdon Tubes are used. For full description of these better gages, in all sizes and ranges, send for Bulletin 45-667.

The HAYS CORPORATION

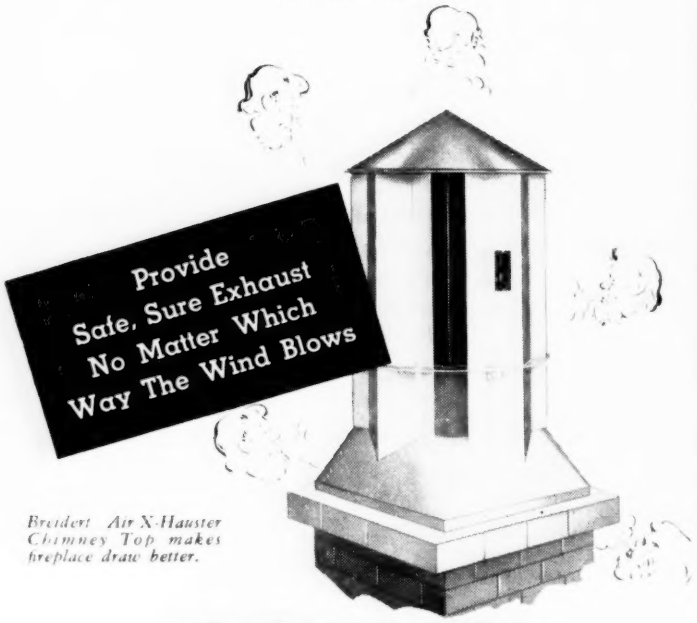
COMBUSTION INSTRUMENTS AND CONTROL

MICHIGAN CITY, INDIANA, U.S.A.

ON CHIMNEYS AND VENT FLUES

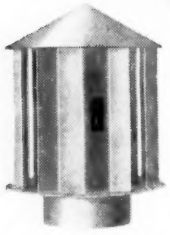
Breidert Air-X-Hausters

(PAT. NO. 2269423)



Breidert Air X-Hauster Chimney Top makes fireplace draw better.

the first scientific improvement in roof ventilators in over 50 years!



Type B Breidert Air-X-Hauster for factories, commercial and residential buildings.

No matter which way the wind blows, no matter how bad the weather—the Breidert *provides positive exhaust.* Designed in accordance with the science of aerodynamics, this revolutionary ventilator utilizes the power of air currents coming from *all angles* to provide safe, positive ventilation without back-draft. Stationary—no moving parts to regulate or get out of order . . . no power consumption . . . compact and pleasing in appearance.

Breidert Air-X-Hauster—the first ventilator to be tested under all variable vertical and horizontal wind conditions . . . with certified ratings published.

Unlike most conventional ventilators which work efficiently only when wind strikes in a horizontal plane, the Breidert has been thoroughly tested—by U. S. Navy and Smith Emery Commercial Testing Laboratories—with the wind blowing in *all* directions. Its remarkably high performance ratings under all conditions are *certified and published.*

Many Thousands in Use all over the Country

Breidert Air-X-Hausters have found wide acceptance among architects, engineers, industrialists, farmers, home owners, ship and boat owners, U. S. Army, U. S. Navy, Maritime Commission, schools, institutions and public buildings. In every case when properly installed, the Breidert has never failed to fully meet every claim made for it!

Free Engineering Data Book, with complete specifications, sent on request. Address

"Ask to see this interesting demonstration"

G. C. BREIDERT CO.,
3129 SAN FERNANDO ROAD
LOS ANGELES 41, CALIFORNIA

Representatives in 50 principal cities throughout the United States

WHAT READERS SAY

Law on Defective Material

EDITOR, HEATING AND VENTILATING:

Could you give me any information on any court decision relative to the following problem affecting many contractors? When a system, such as a return steam system, is installed by a contractor and some of the material supplied by the steam specialties company turns out to be defective, who stands the cost of the following: Time and labor supplied by the contractor to ascertain what is the defective material causing the system not to work; and time, and labor supplied by the contractor to remove and replace the defective material?

Inasmuch as the material being defective is neither the fault of the contractor nor of the customer, it is my opinion that the manufacturer should stand this expense. What is your opinion?

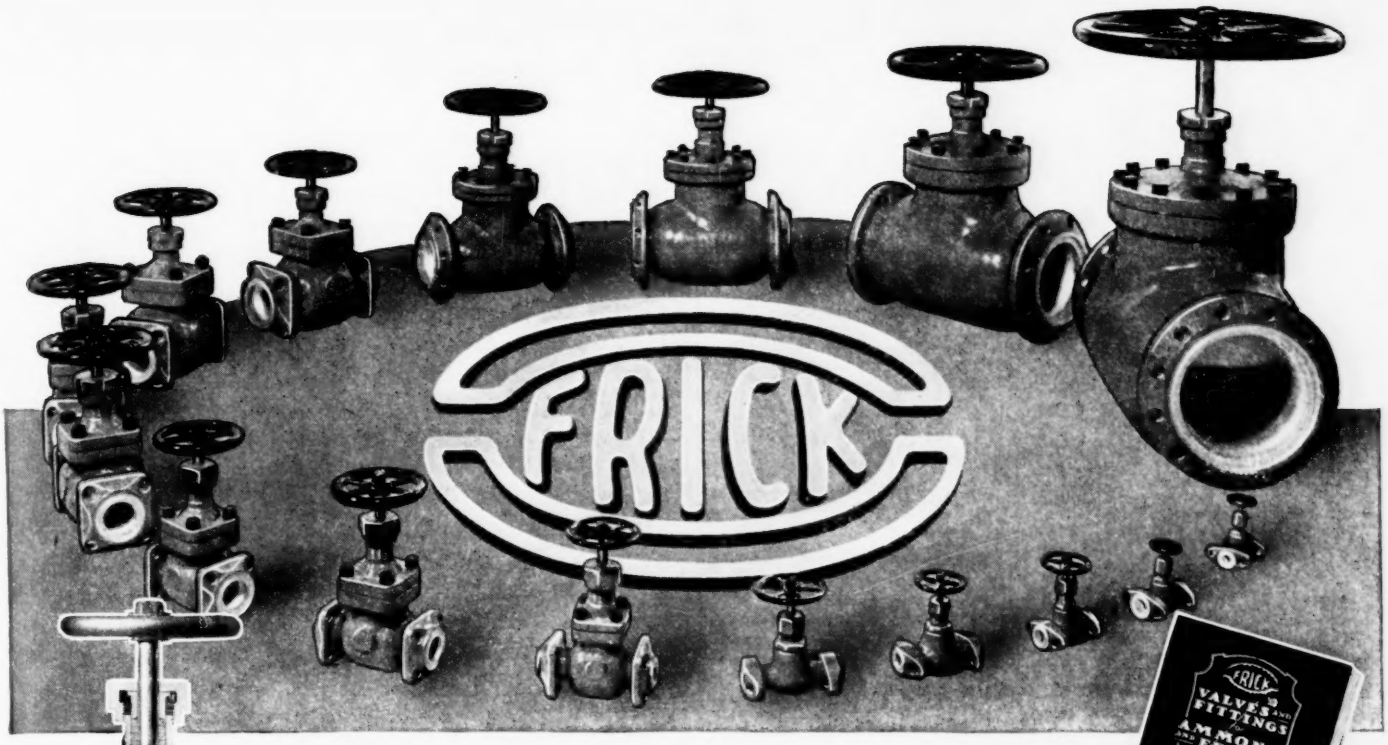
C. S.

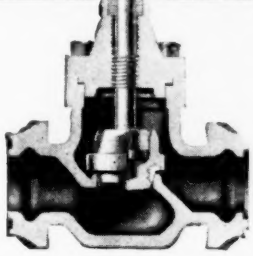
Pittsburgh, Pa.

* * *

First, let us review a late higher court case (Zesch, 183 S.W. (2d) 140). This court held that a manufacturer is not liable for defects in merchandise sold to a dealer who in turn sells it to a consumer or user, unless the dealer is the party damaged. In other words, the contract relationship is not between the manufacturer and the user, and hence the manufacturer is not liable on a guarantee to the user. See also Anchor, 35 Atl (2d) 148.

Now, let us consider the law where, as you state, the manufacturer sells merchandise to a contractor who installs it in a house and the material is defective with the result that the contractor must re-install other material. This is a question of guarantee directly from the manufacturer to the contractor. The former is or can be liable on two kinds of guarantees, one implied and the other expressed. In the latter, the manufacturer must have given a verbal or written guarantee to the contractor. In such a case the manufacturer is liable to the contractor for full financial loss suffered by the contractor if the testimony shows that the manufacturer actually breached the oral or written guarantee. Hence the contractor can recover from the seller the cost of new and non-defective material, plus the labor cost of terminating the agreement with the house owner as by tearing out the defective material and installing the new material, plus the consequential damages suffered by the contractor, as injury to his reputation, and his loss of time resulting from the breach. Also, of course, the manufacturer would be liable for the damages suffered by the building owner, because the contractor would be personally liable to the house owner for this latter amount. For verification of this law see the following higher court cases: Allied, 35 S.E. (2d) 801; Dobbin, 170 Pac (2d) 642; William, 176 N.E. 208; Dillon, 159 S.E. 78; Standard, 25 N.W. (2d) 87; and also see Norry, 45 Atl (2d) 185. In the last case a manufacturer sold material to a dealer who sold it to his cus-

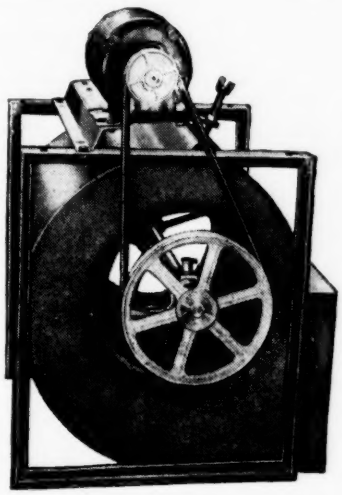




FRICK HIGH-PRESSURE VALVES

Handle loads from 300 to 1500 lb. gauge, according to size, whether using ammonia, Freon, methyl chloride or other high pressure gases and liquids, at either normal or low temperature. Only in Frick valves do you get the combination of high-angle seat, alloy-faced button, and easy re-packing, among other features which have given them the preference for generations . . . Full range of sizes. 1/4" to 14". Screwed valves in sizes up to 2". Frick valves and fittings are stocked by Frick Distributors in principal cities everywhere. Ask for Catalog L; your copy is waiting. Write

FRICK COMPANY
Waynesboro, Penna.



THE

NEW

UNIVERSAL

TYPE "N"

BLOWER

MASSACHUSETTS . .

By changing the position of the oil cup, the four popular discharges (lower horizontal, upper horizontal, down-blast and up-blast) can be obtained. Sizes 7 to 16½ inches wheel diameter.

WRITE FOR BULLETIN No. 110 CATALOG

MASSACHUSETTS BLOWER DIVISION
The BISHOP & BABCOCK Mfg. Co.
4901 HAMILTON AVENUE · CLEVELAND 14, OHIO

BETTER

Flexible

METAL HOSE

FOR EVERY PURPOSE

• SEAMLESS—Constructed from one continuous piece of uniform thickness • PARALLEL CORRUGATION assures maximum strength and flexibility • SPECIAL ALLOYS provide resistance to heat, acid, etc., depending on requirements • AVAILABLE in wide variety of types to convey all kinds of liquids and gases • AVAILABLE in complete form as vibration reducers for Air Conditioning and Refrigeration Units.

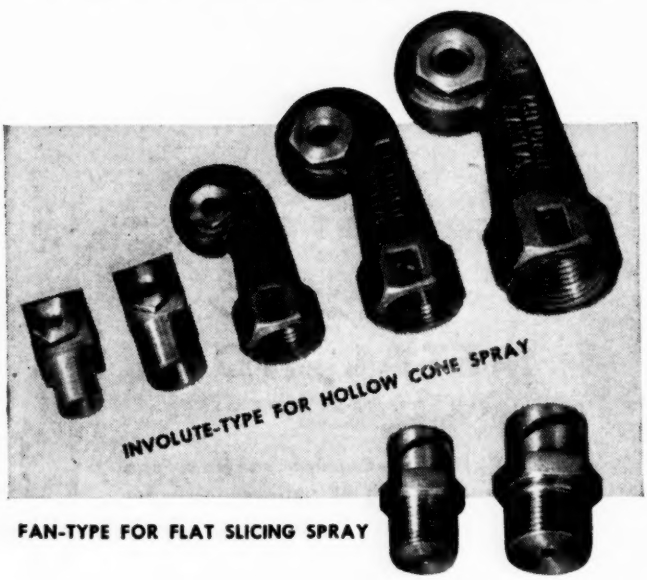
Write Eclipse-Pioneer for information.

ECLIPSE-PIONEER Division of Bendix
TETERBORO, NEW JERSEY

for • SPRAYING
• WASHING
• RINSING
• COOLING
• AIR CONDITIONING

YARWAY

SPRAY NOZZLES



FAN-TYPE FOR FLAT SLICING SPRAY

Get the most out of your Spraying Equipment with minimum power . . . with efficient spraying.

Use Yarway Nozzles. No internal vanes or other restrictions to clog or hinder flow. Two types—Yarway Involute-type producing a fine hollow spray with minimum energy loss, and Yarway Fan-type producing a flat fan-shaped spray with time-saving slicing action for cleaning.

Wide range of standard sizes and capacities. Cast or machined from solid bar stock.

Thousands in use. Write for new Bulletin N-616.

YARNALL-WARING COMPANY
104 Mermaid Avenue Philadelphia 18, Pa.

tomer. The material was defective and the dealer sued the manufacturer who was held liable for the full damages sustained by both the dealer and the customer.

Of course, it is certain that a manufacturer may avoid all liability by inserting a clause in a contract to the effect that he will not be liable on any guarantee. In this case the contractor takes the material without any guarantee, and if the materials are defective the manufacturer cannot be held liable. See C.V. 19 S.E. (2d) 430. In this case the contract of sale contained a clause by which the manufacturer agreed to supply new material for defective material which in the manufacturer's judgment was defective. This court held such a clause valid.

Now assume that the manufacturer did not give any guarantee. In such a case the manufacturer is liable on a guarantee if he knew for what purpose the material was to be used and such materials proved to be defective. This is the law of implied guarantees and the courts assume that when a manufacturer does not state that he does give a guarantee, and does not state that he does not give a guarantee, then it is assumed that he guarantees that his material is reasonably suited for the purposes that he knows it will be put by the buyer. However, in respect to implied guarantees the jury must decide from the testimony whether or not the material was actually defective, and hence from the standpoint of implied guarantees there is small chance of a contractor winning a suit unless he proves that the material was not suited for the purposes that the manufacturer knew it would be used. See following cases on implied guarantees: Giant, 11 Fed (2d) 360; McNeil, 274 Fed 397; Dow, 90 A.L.R. 406; and Consolidated, 23 Fed. (2d) 416. But also see Sible, 14 N.E. (2d) 832. In this case the contractor ordered material *by description.* The seller did not know for what use it was being purchased. The court held that the seller could not be liable because the material did not give satisfaction to the purchaser. Also, if a contractor fails to conform with a manufacturer's instructions as to installation that relieves the latter from liability.

Refer to Crockett, 156 Fed (2d) 817. This is a new case decided only a few months ago, and the court clearly explains when and how to determine whether a manufacturer or the contractor is liable for defective pipe and other material.

Leo T. Parker
Attorney-at-Law

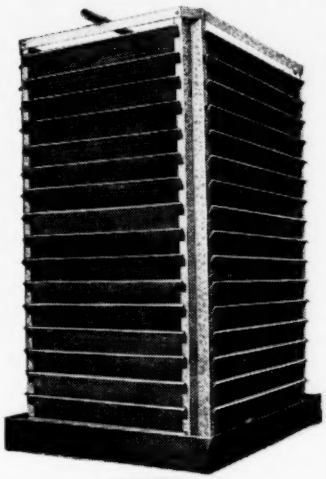
Cincinnati, Ohio

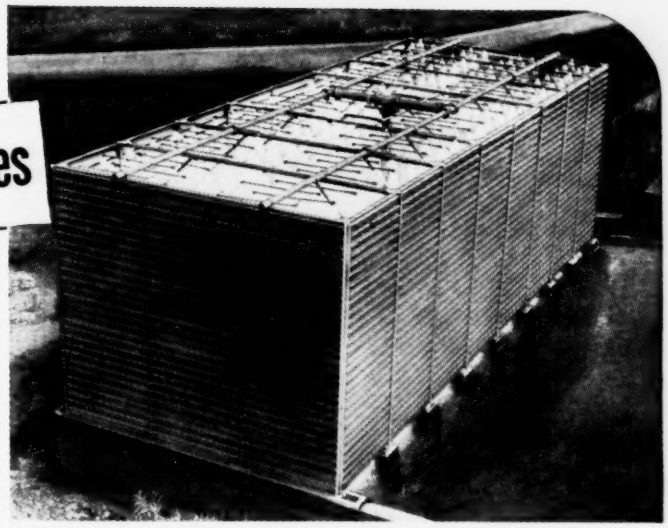
INDUSTRIAL DEGREE-DAYS
March, 1948

City	55F Base	45F Base
Baltimore, Md.	284	127
Buffalo, N. Y.	633	361
Chicago, Ill.	553	306
Cleveland, Ohio	526	290
Detroit, Mich.	623	350
Indianapolis, Ind.	409	206
New York, N. Y.	434	208
Philadelphia, Pa.	374	170
Pittsburgh, Pa.	392	197
St. Louis, Mo.	382	192

Binks NATURAL DRAFT COOLING TOWERS

30 standard sizes





Binks Type "S" Cooling Towers are manufactured in capacity ranges from 10 to 1200 GPM. This wide range of sizes enables you to choose exactly the tower you need to fit your requirements without the needless expense of a custom-built unit. Binks Type "S" Towers are the accepted standard for cooling condenser circulating water from refrigeration and air conditioning compressors, and for cooling water-jacketed engines. They will provide low cost cooling of highest efficiency for any manufacturing process where heat is dissipated by circulating water or other fluids.

Send today

for bulletins describing the Binks Type "S" natural draft cooling towers in which you are interested.

BULLETIN NUMBERS:

30. Single Section Towers
31. Multiple Section Towers (one bay wide)
32. Large Capacity Towers
40. All Redwood Towers

Please state how tower will be used, also capacity required.

THERE'S A BINKS TOWER FOR EVERY COOLING JOB

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HOSE FOR USE IN ANY INDUSTRY!

LIGHT, STRONG, FLEXIBLE

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SPIRAL-REINFORCED HOSE

Flexaust is suitable for a wide variety of suction and pressure uses in ventilation, dust collection and fume control. **SIZES $1\frac{1}{4}$ inches to 24 inches.** Write for full information on this all-purpose hose. Various Flexaust types, accessories, and other hose types also available:

BLOFLEX — *Non-rei..forced col'apsible*

PORTOVENT — *Ring-reinforced retractable*

AMERICAN VENTILATING HOSE CO.

Dept. H5, 15 Park Row, New York 7, N. Y.
Branch Offices: New Orleans, La., San Francisco, Calif., Washington, D. C.
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Big Boy— strong on back, but weak on method

Little Man with the right answer— *for saving time and making money*

For Installation or Repair

A PORTABLE

Tal Bender

with NEW BEND Indicator

Anyone can make perfect bends with a Tal machine, on-the-job or in-the-shop. This fast working, easy-to-operate bender for wrought iron or steel pipe does in minutes work that otherwise takes many hours. No wonder thousands are in service everywhere. Write today for factual bulletin.

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STAINLESS STEEL *Solenoid Valves* ★

★ Standard pressure range, 5 to 250 psi
★ Dimensions 2¾" high x 1⅝" dia.
★ Impregnated coils withstand moisture and condensation
★ Soft insert seats prevent leakage
★ Spring loaded for positive action
★ Stainless steel parts highly resistant to corrosion and wear
★ Power consumption 10 watts max.
★ Pipe connections to specification
★ Also many special valves for handling pressures from 5 to 850 psi

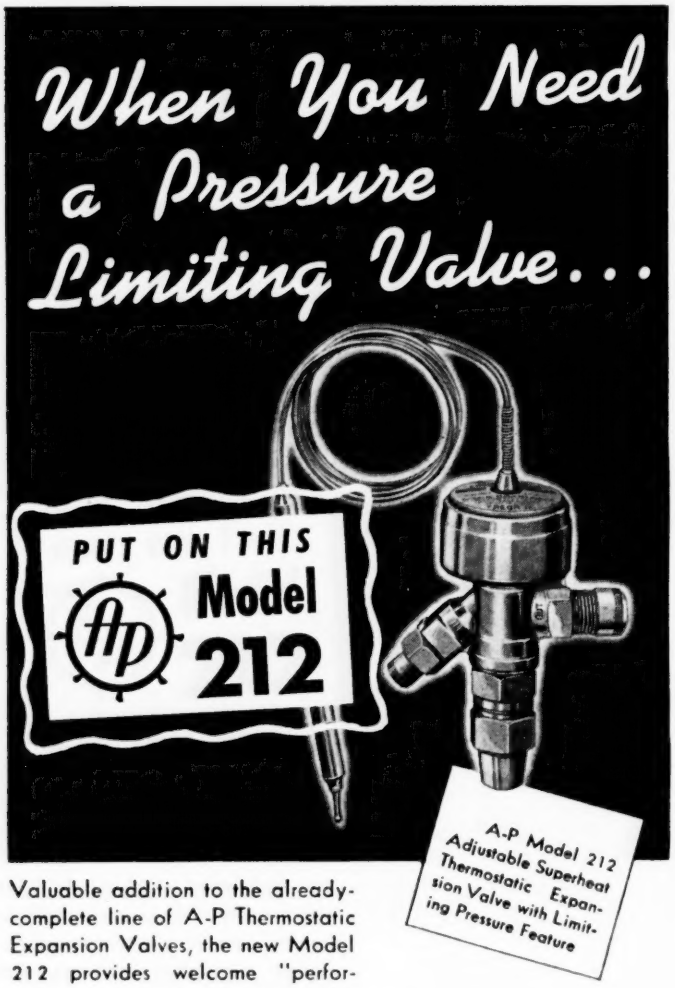
THREE WAY - TWO POSITION
TWO WAY - NORMALLY CLOSED
TWO WAY - NORMALLY OPEN

Skinner Stainless Steel Solenoid Valves are rugged, accurate, compact and long lived. They are worthy additions to any product you may have which requires control or metering of fluid and gaseous media. Skinner will be pleased to make recommendations on your particular design applications — they have for hundreds of others. Write today for details and catalog.

Skinner ELECTRIC VALVE DIV.
formerly Allied Control Valve Division
THE SKINNER CHUCK COMPANY
136 Belden Ave., Norwalk, Conn.

SKINNER ELECTRIC VALVES

When You Need a Pressure Limiting Valve...



Valuable addition to the already-complete line of A-P Thermostatic Expansion Valves, the new Model 212 provides welcome "performance insurance" on any system where motor overload may be indicated. It offers advantages never before achieved in a pressure limiting thermostatic expansion valve.

You may install the A-P Model 212 in place of any standard thermostatic expansion valve of similar capacity (½ and 1 ton Freon or Methyl). Like all A-P expansion valves, it is liquid charged and may be mounted in any position or ambient temperature without affecting the control-accuracy at the bulb. Operating suction pressure is limited to a predetermined setting by an exclusive and entirely new diaphragm unit. This diaphragm actuates the needle pin, allowing the valve needle to move towards the closed position, until the overload condition has passed. Then the valve operates in the normal manner to control superheat through the thermostatic bulb and sensitive large-area diaphragm.

Cross section . . . showing new pressure limiting diaphragm unit.

Model 212 is available to limit pressures at 15, 40, and 55 lbs. Freon 12, and at 10 and 30 lbs. Methyl. Capacity, ½ and 1 ton Freon or Methyl. Model 211 with fixed superheat, same capacity, is also available.

Pick up the new A-P Model 212 at your Wholesaler, or write for Bulletin E-156, and condensed catalog.

AUTOMATIC PRODUCTS COMPANY

2462 NORTH THIRTY-SECOND STREET, MILWAUKEE 10, WISCONSIN
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R501C

DEPENDABLE REFRIGERATION VALVES

FOR HEATING . . . AIR CONDITIONING . . . REFRIGERATION

CANADIAN DEGREE-DAYS FOR MARCH, 1948*

City	March		Cumulative, Sept. 1 to Mar. 31	
	1948	Normal	1947-48	Normal
Calgary, Alta.	1466	1215	8018	7881
Charlottetown, P. E. I.	1380	1203	7187	6869
Crescent Valley, B. C.	998	961	6372	6704
Edmonton, Alta.	1553	1290	8657	8589
Fort William, Ont.	1442	1386	8883	8590
Grand Prairie, Alta.	1491	1339	8759	8795
Halifax, N. S.	1177	1066	6232	6134
London, Ont.	1066	1073	6607	6326
Medicine Hat, Alta.	1432	1150	7715	7588
Moncton, N. B.	1383	1190	7565	7296
Montreal, P. Q.	1201	1265	7434	7373
North Bay, Ont.	1401	1280	8399	7933
Ottawa, Ont.	1243	1256	7673	7638
Penticton, B. C.	846	787	5430	5566
Porquis Junction, Ont.	1544	1550	9305	9614
Prince George, B. C.	1240	1091	7718	7768
Quebec City, P. Q.	1308	1311	7784	7999
Regina, Sask.	1733	1504	9711	9641
St. John, N. B.	1218	1132	6860	6784
Saskatoon, Sask.	1773	1445	9813	9356
Toronto, Ont.	1015	1072	6029	6226
Vancouver, B. C.	716	682	4542	4479
Victoria, B. C.	660	651	4077	4065
Windsor, Ont.	961	995	5919	5872
Winnipeg, Man.	1631	1531	9619	9622

*These data are supplied through the courtesy of the Meteorological Division, Air Services Branch, Department of Transport, Canada, with the cooperation of N. W. Etter, Heating Engineer, Enamel & Heating Products Limited, Sackville, N. B.

. . . Since the Last Issue

Raytheon Manufacturing Co., Waltham, Mass., has announced the appointment of **James J. Tynan** as sales manager of the Commercial Products Division. **Kenneth V. Curtis** has been named product manager. Mr. Tynan was formerly in charge of sales and service of the Mariners Pathfinder radar, heretofore distributed by Raytheon's marine affiliate, Submarine Signal Co. This activity is now transferred to the Commercial Products Division. Mr. Curtis joined Raytheon's marine department in 1945 as application engineer.

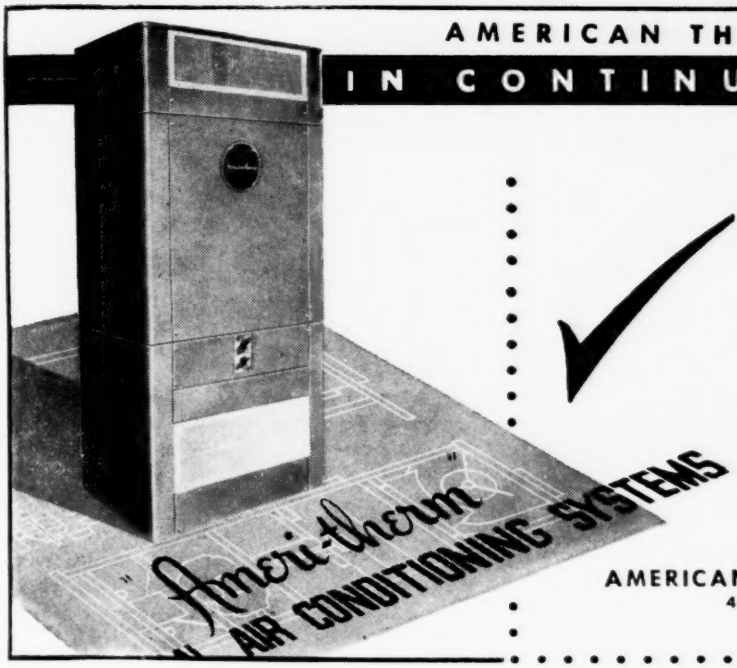
Anthracite Institute has added three new field representatives to its staff to cover territory in the Albany, N. Y., Southern New Jersey, Delaware, Maryland and District of Columbia areas. **R. C. Girke**, formerly with the Institute in the Albany territory, has returned to his original position. **George W. Lenza**, formerly with the Electric Furnace Man Co. and the Solid Fuels Administration for War, will cover Southern New Jersey and **John Hensyl**, originally with Anthracite Industries, Inc., as a New York World's Fair exhibit representative, later a Captain in the U. S. Army, will cover Delaware, Maryland and District of Columbia.

Robert West has been appointed regional sales director for the midwestern area by **Typhoon Air Conditioning Co., Inc.**, of Brooklyn, N. Y. Formerly with the Hussman, Worthington and Frigidaire organizations, Mr. West will supervise Typhoon representatives in Illinois, Missouri, Kansas, Nebraska, Iowa, Wisconsin, and Minnesota.

James M. White, formerly vice-president in charge of manufacturing at Allis-Chalmers' Milwaukee plant, has joined the **Allen-Bradley Co.** as a member of the production management staff, in which capacity he will investigate cost and inventory methods and participate in handling production management prob'ems.

AMERICAN THERMAL INDUSTRIES, INC.

IN CONTINUOUS PRODUCTION



Check the "PLUS" features of "The Packaged Great of '48"

GREATER PROFITS! LOWER COSTS!

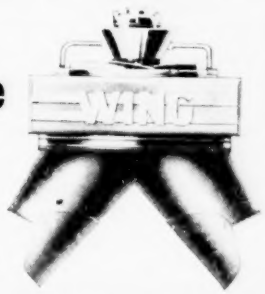
5 SUPERB MODELS

3 - 5 - 7½ - 10 and 15 TONS

Manufactured by
AMERICAN THERMAL INDUSTRIES, Inc.
440 Illinois, Detroit 1, Michigan

Ameri-therm

Revolving Heaters for Thorough Heat Coverage



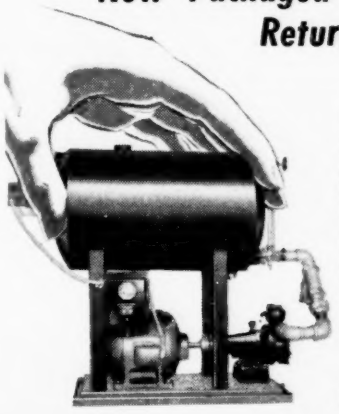
The remarkable feature of Wing Revolving Unit Heaters that distinguishes them from other types of heating systems is the fact that the discharge outlets REVOLVE. This assures a thorough circulation of the heated air to all parts of the working level regardless of obstacles.

WRITE FOR BULLETIN HR-5

158 W. 14th St., N. Y. 11, N. Y.—Factories: Newark, N. J. and Montreal, Can.

L. J. Wing Mfg. Co.

New "Packaged" Roth Condensate Return Units Offer Greater Flexibility!



Meet most demands . . . simplify installations . . . save space . . . and assure efficient, economical, service-free performance. Roth pump design simplicity and precision construction insure longer service, lower fuel costs. Capacities range up to 17,000 sq. ft. E.D.R., pressures up to 100 lbs. Also available for boiler feed service. Knockdown units for conversion to boiler feed or return service. Ask for Data Sheets 201 and 202.

Send for price, data sheets, discounts.

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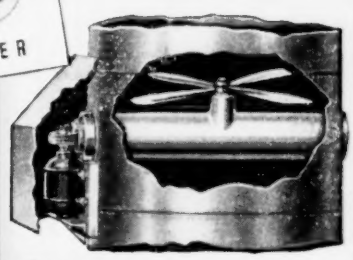
Turbine Type Pumps and Equipment

Dept. HV, 2436 4th Ave., Rock Island, Ill.

Solve your Ventilating Problems with "INTERNATIONAL"

DUCT BOOSTERS STACK FANS AND BLOWERS

DUCT BOOSTER



STACK FAN

If you have a problem of forced draft or ventilation, send for descriptive literature showing typical installations in ships and industrial plants, apartment houses and public buildings.

ASK FOR BULLETIN No. 99

INTERNATIONAL ENGINEERING INC.
DAYTON 1, OHIO.

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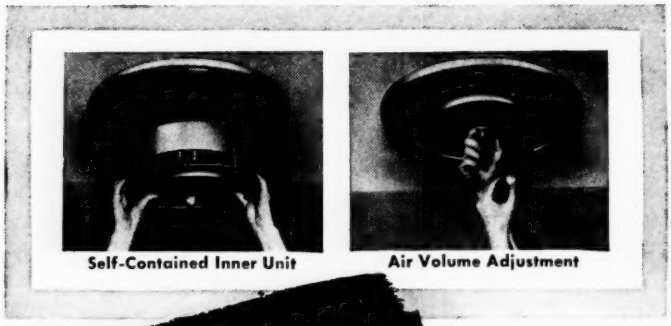


FAST INSTALLATION

"Custom-made" air pattern with Kno-Draft Adjustable Diffusers in Champion Spark Plug Plant

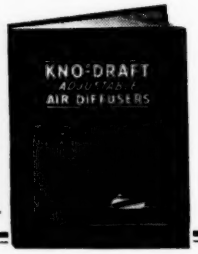
PROBLEM: A ceramic kiln radiates heat on one side and a cold window-filled wall creates drafts on the other. The space is long and narrow with low head room. The occupants work in short sleeves. Unusually large volumes of supply air have to be brought in to combat the heat of the kiln. Space for duct work above the room is limited so that diffusers have to be spaced much closer than usual. The supply air stream has to be directed slightly above the horizontal and evenly distributed so that no drafts are felt by the personnel.

SOLUTION: Kno-Draft Adjustable Air Diffusers were chosen because of their ability to control air direction, volume and throw. A "custom-made" air pattern was created which thoroughly mixed room and supply air, maintained uniform temperature throughout and eliminated drafts, hot spots, and cold spots. *Installation* was fast. Kno-Draft self-contained inner units cut installation time up to 50%. *Balancing* was fast. CFM readings were taken directly with Velometer. A twist of the wrist changes air volume on each diffuser.

Free — New handbook on Air Diffusion

It contains the latest engineering data on air diffusion and is profusely illustrated with charts, photographs, sketches and dimension prints that simplify the selection, application, location, assembly, erection, testing and adjusting of Kno-Draft Adjustable Air Diffusers. It is designed to help you get top efficiency from an air conditioning system by creating "custom-made" air distribution patterns.

For your FREE copy, please write Dept. E-12.



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Air Diffusion • Air Purification • Air Recovery

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IN CANADA: Douglas Engineering Co., Ltd., 190 Murray Street, Montreal 3, P. Q.

C. Wesley Alcott, Jr., has been appointed field engineer for the **Alco Valve Co.**, St. Louis manufacturers of refrigerant control valves, in the New York City area, with headquarters at Alco's New York office in the Chanin Building.

The retirement of **Charles G. Binder,** chief engineer of application at **Warren Webster & Co.** since 1928, has been announced. Mr. Binder, whose home is in Merchantville, N. J., joined the Webster engineering department in 1920. Since then he has been responsible for the training and development of scores of heating engineers. Many of these men are now members of the Webster field organization. Associates of Mr. Binder at Warren Webster honored him at a farewell dinner and presented him with a set of golf clubs. The presentation was made by **Charles J. Kern,** his assistant, who succeeds him as manager of application engineering and service.

C. G. Binder

At the Thirty-First Annual Meeting held recently at the Statler Hotel, Buffalo, N. Y., the **National Association of Fan Manufacturers** elected the following officers for 1948: **R. A. Wasson,** president; **T. J. Flanagan,** vice-president; and **L. O. Monroe,** secretary-treasurer. Mr. Wasson is vice-president and general manager of the Clarage Fan Co., Kalamazoo, Mich., and Mr. Flanagan is president of the Garden City Fan Co., Niles, Mich.

Yarnall-Waring Co., Philadelphia announces these appointments in its sales department: **R. S. Pollard,** formerly of Pyle-National Co., has been made sales manager of the steam trap division; **Leland C. Campbell** has been appointed southwestern representative, working from the Dallas sales office; **Howard R. Wunker,** sales representative in the company's new Cincinnati office and **J. Frank Long,** sales representative in the company's new St. Louis office.

At the Ninth Annual Meeting, held recently at the Sheraton-Plaza Hotel, Daytona Beach, Fla., the **Propeller Fan Manufacturers' Association** elected the following officers for 1948: **Lyman C. Reed,** president; **W. J. Lohman, Jr.,** vice-president; **L. O. Monroe,** secretary-treasurer. Mr. Reed is president of Reed Unit-Fans, Inc., of New Orleans and Mr. Lohman is an official of Chelsea Products, Inc., of Irvington, N. J.

L. C. Watson, formerly with Trumbull Manufacturing Co., has been appointed sales manager of distributor sales of the **Allen-Bradley Co.,** Milwaukee, Wis. Mr. Watson, after an early start with the old Pettingill-Andrews Co., in Boston, joined Trumbull and was, until recently, eastern regional manager and products manager in charge of control. He is a member of the National Federation of Sales Executives, member of the NEMA industrial control section, and a registered professional engineer in Massachusetts. He will make his headquarters in Milwaukee.

L. C. Watson

Appointment of **D. F. Kane** as manager of the **United States Radiator Corp.** plant at Dunkirk, New York, has been announced. Mr. Kane has been an employee of the corporation for 33 years.

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Automatically Yours For Better Temperature Control

GENERAL CONTROLS
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More sensitive to air currents. More snug-fitting louvres. Swivel joints that never wear loose or rattle. Sizes from 8" to 72" square —also rectangular.

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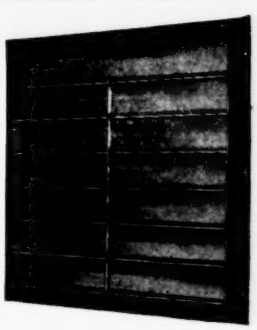

"ELGO" TYPE AUTOMATIC SHUTTER Front View (Closed)

Free CATALOG

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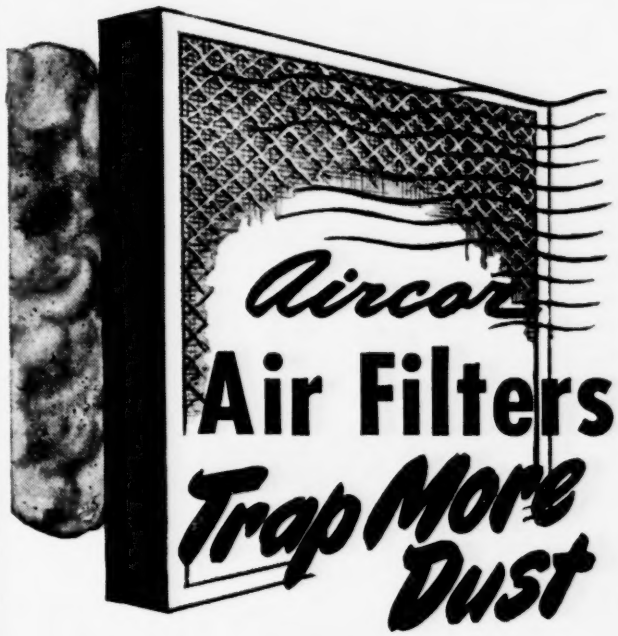
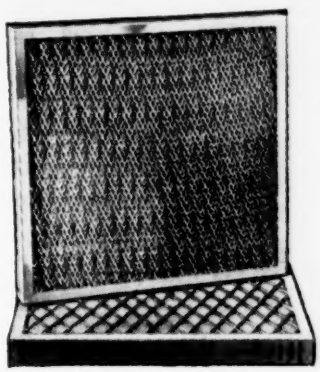


Aircor Air Filters Trap More Dust

For Air Conditioning, Heating and Ventilating



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Also available for heavy duty service on industrial and special applications—in 2" to 4" thickness. Holding frames (for V-type or straight banks) are made for all type filters.

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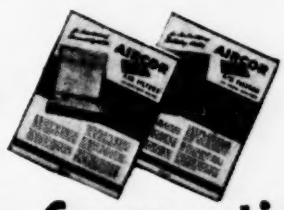

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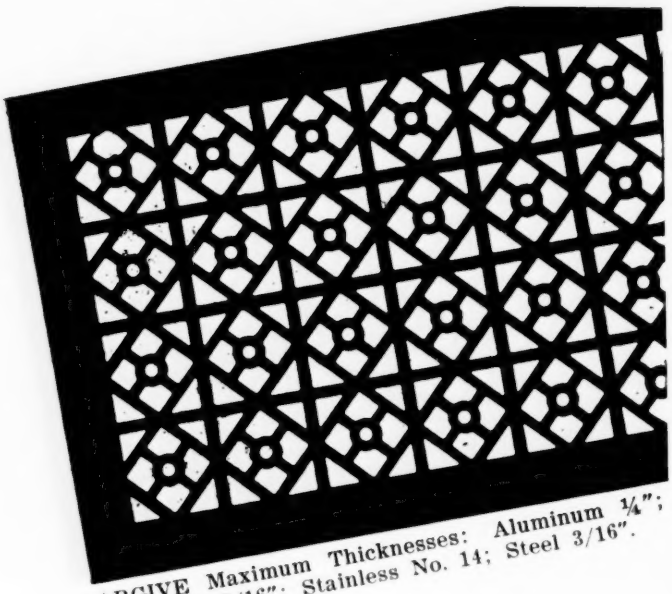

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Sales Offices in Principal Cities

The appointment of **C. H. Schuettenberg** as sales manager has recently been announced by the **Holcomb & Hoke Mfg. Co., Inc.**, of Indianapolis, manufacturers of heating and ventilating equipment. Mr. Schuettenberg, formerly sales manager of the Link Belt Co., Stoker Division, has been associated with the coal and stoker industries all his life. His experience ranges all the way from retail selling, through dealer and distributor connections, to managing national sales forces.

Thomas J. Hester, 69, president of **Hester-Bradley Co.,** St. Louis, died at his home on March 4th after a month's illness. Mr. Hester's firm is the St. Louis representative for Warren Webster & Co., Nash Engineering Co., and Kewanee Boiler Corp. Mr. Hester, a member of ASHVE since 1919, was a registered engineer in the state of Missouri. He was born in St. Louis on March 1, 1879, attended local public schools and Christian Brothers College. He was first connected with the L. M. Rumsey Mfg. Co., later with Cahill-Swift & Co., in St. Louis, and then with Jas. B. Clow Co., Chicago. He was one of the organizers and an officer of Iroquois Engineering Co., Chicago, and was in charge of their St. Louis office until he went into business for himself. Hester-Brad'ey Co., a partnership, was formed by E. P. Bradley and Mr. Hester in 1914, and continued as such until the firm was incorporated in 1923. The firm has represented Warren Webster in the St. Louis territory since 1916.

Thomas J. Hester

At the last annual meeting of the directors of the **Baker Ice Machine Co., Inc., Albert F. Milton** was elected Treasurer of the company. In addition to this new responsibility, Mr. Milton will continue to act as chairman of the executive committee of the board of directors and secretary of the company.

Charles Davies, New York Industrial Designer, has been retained by the **United States Air Conditioning Corp.** of Minneapolis, to develop and style a complete line of room coolers, store coolers, unit heaters and air conditioning equipment.

E. W. Becker has been appointed regional manager of the Unit Air Conditioner Division of the **Fedders-Quigan Corp.**, Buffalo, N. Y. Mr. Becker is covering the eastern seaboard territory with resident headquarters in Freeport, N. Y.

Pan-L-Heat Corp., 2838 N. E. Columbia Boulevard, Portland, Ore., has announced the opening of its new, modern Pan-L-Test Laboratory constructed to obtain technical and accurate data on radiant heating equipment. This is said to be one of the few laboratories of its kind in the country whose facilities will be made generally available to manufacturers and designers of heating and ventilating equipment. Robert O. Baer, engineer, is in charge of all tests and technical information.

Stratton & Terstegge Co., has announced two executive appointments in the Anchor Division. **Edward Clifford** who joined the firm as regional manager of the southern territory in 1939, has been promoted from sales manager to general manager. Succeeding him as sales manager is **H. Mansell Evans,** recent regional manager of the southeastern territory. Mr. Clifford replaces W. L. Schultz who resigned because of ill health.

William H. Haag has been appointed works manager of **Perfection Stove Co.** A graduate of the University of Michigan with a degree in mechanical engineering, Mr. Haag came directly to Perfection in 1928, following his graduation. In his new post Mr. Haag replaces C. A. Blackburn, who was recently promoted to vice-president and director of manufacturing.

H. F. Hildreth, sales manager, Refrigeration Specialties Division, Westinghouse Electric Corp., Springfield, Mass., was elected president of the **Refrigeration Equipment Manufacturers Association** at its annual board of directors meeting held in Chicago, April 1 to 3. He succeeds E. M. Flannery, vice-president of the Bush Manufacturing Co., Hartford, Conn. Other new officers elected at this meeting were: **K. B. Thorndike,** vice-president, Detroit Lubricator Co., Detroit, Mich., vice-president; **R. H. Israel,** sales manager, Virginia Smelting Co., W. Norfolk, Va., treasurer; **G. M. Kingsland,** sales manager, Specialties Division, Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., secretary. New directors of the association also elected at this meeting are **P. L. Craft,** Mueller Brass Co., Port Huron, Mich.; **Jas. F. Dailey,** president, Typhoon Air Conditioning, Inc., Brooklyn, N. Y.; **H. T. Jarvis,** vice-president, Refrigeration Engineering, Inc., Los Angeles, Calif.; **J. K. Noel, Jr.,** vice-president, Victor Products Corp., Hagerstown, Md., **H. R. Roberts,** general sales manager, Whiting Corp., Chicago, Ill., **R. L. Sears,** sales manager, Lynch Manufacturing Corp., Toledo, Ohio; **W. J. Stelpflug,** vice-president, Hussman Refrigeration, Inc., St. Louis, Mo.

R. B. Crawford has been elected vice-president and member of board of directors of **Buildice Company, Inc.,** Chicago industrial refrigeration manufacturers. Mr. Crawford has been with Buildice as sales manager since September of 1947, and will continue in that capacity in addition to his new executive duties.

The Kennedy Valve Manufacturing Co. of Elmira, New York, has announced the election of **Charles F. Kennedy** as president. Mr. Kennedy has been with the company since he was graduated from the University of Michigan in 1937. He is a grandson of the late Daniel Kennedy, who founded the business in 1877. **Matthew E. Kennedy,** who has been president of the company since 1928, was elected chairman of the board of directors and will also retain his position as treasurer. **Leon H. Marsh,** vice-president and secretary of the company, died March 11, 1948, following a heart attack.

C. F. Kennedy

The **Sawyer Bailey Corp.** has purchased the assets of the **Buffalo Turbine Corp.,** including all patents, engineering data, drawings, test equipment, tools, machinery and inventory.

Thomas E. Doyle, the first employee of **Dravo Corp.,** and president of Dravo-Doyle Company from 1908 to 1925, died in Pittsburgh, April 1, at the age of 85. Mr. Doyle, a native of Blairsville, Pa., became associated with Francis R. Dravo, shortly after F. R. Dravo & Co. was organized in 1891. He supervised early machinery installation projects for engines, boilers and pumps at power plants, waterworks and other facilities, and was closely connected with the firm's growth and activity. In 1901, when Dravo-Doyle Company was organized, he joined that company and became its president seven years later, a post he held until his retirement in 1925. Besides his industrial activities, Mr. Doyle was a director of Homewood Bank of Pittsburgh, and served 23 years on the Pittsburgh Board of Education.

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Herman Nelson Distributors meet your requirements promptly from stock for both equipment and installation materials. Members of the sales and engineering departments are available for immediate service.

Contact the nearest Herman Nelson Distributor when you need prompt delivery of quality heating and ventilating equipment.

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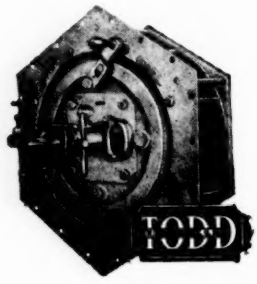

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The retirement of **J. T. Collins,** New York branch manager of the **Frigidaire Sales Corp.** and veteran General Motors executive, has been announced. Mr. Collins' General Motors association began in 1914 when he joined the Chevrolet organization. He joined Frigidaire 15 years ago as manager of The New York branch operation. With word of Collins' retirement came a concurrent announcement of the promotion of **T. A. Arminio,** assistant New York branch manager, to branch manager. Mr. Arminio first started with General Motors in 1918 and after serving with other units was transferred to the New York branch of Frigidaire in 1933.

White-Rodgers Electric Co. announces the election of **J. A. Rodgers** as president. **L. F. Blough** is retiring as president to undertake other duties connected with the organization.

McDonnell & Miller, Inc., manufacturers of boiler water feeders, low water cut-offs and safety relief valves, recently announced the appointment of **John W. James** as chief research engineer. Mr. James joined the McDonnell & Miller organization from the Iron Fireman Manufacturing Co., where he held the position of research engineer from 1943 until the present. Previously, Mr. James had spent eight years as technical secretary of the ASHVE. A graduate in mechanical engineering from Oregon State College, he received his Master's degree in mechanical engineering from the University of Wisconsin.

The appointment of **Charles T. Button** as vice-president in charge of sales of the **Howell Electric Motors Co.,** Howell, Mich., has been announced. **Thomas J. Manning,** assistant to the president, was named a vice-president. McPherson Browning, Aubrey C. Flood, Theodore J. Kauffeld, R. Bruce McPherson, George D. Miller, B. Winthrop Pizzini and Ralph J. Romer were re-elected to the board of directors. Mr. Button was also elected to the board of directors.

Bell and Gossett Co., Morton Grove, Ill., announces the appointment of **William A. Boone** as assistant sales manager. Mr. Boone has been with B & G since 1940 and has been most active in the industrial division of the company. The industrial division manufactures and distributes such products as heat transfer equipment, centrifugal pumps, quench oil coolers and refrigeration components.

W. H. Rowand has been named chief engineer of **The Babcock & Wilcox Co.** The position is a new one created by the recent promotion of Alfred Iddles to the presidency of the company.

Turner Construction Co. has opened a Chicago office in the Bankers' Building, 105 West Adams St. **Clarke I. Knudson,** contractor-engineer, is in charge. This will be the fourth office of the Turner Construction Company, the others being in New York, Philadelphia and Boston.

Getting Personal

Buford H. Martin *(Heating by Electricity in the Tennessee Valley Area,* page 57) became associated with the electrical industry in 1924 when he was employed as a lighting engineer by the Tennessee Electric Power Co. In 1932 he was made manager of the company's Lighting Sales Department. In 1939 he affiliated with the TVA and since then has been closely associated with the development of electric space heating in the Tennessee Valley area. He has been responsible for coordinating studies that have been made concerning the characteristics of house

heating loads as they affect the consumer and the power distributor.

T. W. Newberry

B. H. Martin

Mr. Martin is past president of the Chattanooga Engineers' Club, is a member of the Illuminating Engineering Society, and an associate member of the AIEE.

T. W. Newberry (co-author with Mr. Martin, page 57) received his EE degree from Georgia School of Technology in 1929. For the next three years he was associated with the Allis-Chalmers Manufacturing Co., Milwaukee, Wis.

From 1933 until the TVA acquired the properties of the Tennessee Electric Power Co., he was commercial sales engineer for the latter company. He promoted sales of refrigeration and air conditioning equipment and other commercial load building appliances. Since 1945 he has been employed by the TVA as heating and air conditioning engineer.

Heating, Piping and Air Conditioning Contractors

A tentative program has been drafted for the 59th annual meeting of the Heating, Piping and Air Conditioning Contractors National Association to be held at the William Penn Hotel, Pittsburgh, Pa., June 2-4.

A talk on Labor Relations under the Taft-Hartley Act is scheduled for the closing day of the convention. The annual dinner-dance will be held on Thursday evening. The tentative program follows:

Wednesday, June 2

10:30 a.m. Meeting of Technical Committee — National Certified Pipe Welding Bureau

11:00 a.m. Meeting and Luncheon—Junior Association

2:00 p.m. Open Session

Welcome to Pittsburgh — Hon. David L. Lawrence, Mayor

Greetings — Paul A. Edwards, President Pittsburgh Association

Response—Thomas L. Eagan, Vice-President, National Association

The President's Address—James M. Anderson

Report of Credential Committee

Report of Treasurer—George P Nachman

Report of Auditing Committee

Report of Secretary—Joseph C. Fitts

Address—

Report of Publication Committee — Wray M. Scott, Chairman

5:00 p.m. Committee Meetings for Organization

Thursday, June 3

8:00 a.m. Breakfast—Junior Association

9:30 a.m. Open Session

Report on Plumbing and Heating Industries Bureau—Arnold H. Goelz

Report on Committee of Ten—Coal and Heating Industries—Harry H. Hart

Report of Membership Committee—Thomas L. Eagan, General Chairman

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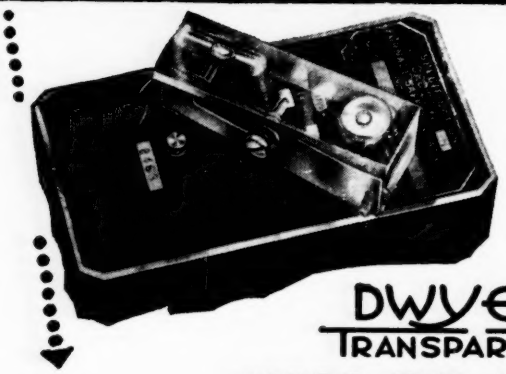

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with Circular Level

Two

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gives both direction and amount of leveling necessary

Inclined Tube Draft Gage...

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The long-famed DWYER Visi-Draft—the only truly pocket-size gage of its kind — now becomes a combination Draft Gage and Precision Level. By the addition of the circular spirit level built into the transparent plastic body, the Visi-Draft determines the level of oil burners and controls. Gets into those tight spaces or cramped corners with ease!

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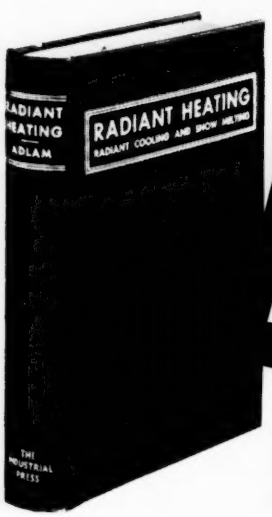

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Report of Home Heating Committee—J. A. Ljunggren, Chairman

12:00 M. Luncheon for members, and trip to pipe mill sponsored by the National Tube Co.

Friday, June 4

9:30 a.m. Open Session

Report of Committee on Certification — Daniel Hayes, Chairman

Report of Committee on Welding—Richard S. Tobin, Chairman

Report of National Certified Pipe Welding Bureau—William W. Murray, Jr., Chairman

Report of Editorial Committee, Standard Manual on Pipe Welding—John H. Zink, Chairman

Address—Labor Relations under the Taft-Hartley Act—Robert N. Denham, General Counsel, National Labor Relations Board

Report of Secretaries' Conference—Louis T. Braun, Chairman

2:00 p.m. Open Session

Report of Committee on Industrial Relations—Robert B. Miller, Chairman

Report of Nominating Committee

Report of Resolutions Committee

Installation of Officers

COMING EVENTS

MAY 18-21, 1948—39th annual meeting of National District Heating Association, Hotel Statler, St. Louis, Mo. Secretary, John F. Collins, Jr., 827 N. Euclid Avenue, Pittsburgh 6, Pa.

MAY 24-27, 1948—66th convention and exposition of the National Association of Master Plumbers, Philadelphia Convention Hall, Philadelphia, Pa. Association office 1105 K St., N.W., Washington 5, D. C.

MAY 31-JUNE 2, 1948—Spring meeting, American Society of Refrigerating Engineers, New Ocean House, Swampscott, Mass. Secretary, M. C. Turpin, 40 W. 40th St., New York 18, N. Y.

JUNE 2-4, 1948—Annual meeting, Heating, Piping and Air Conditioning Contractors' National Association, Hotel William Penn, Pittsburgh, Pa. Secretary, Joseph C. Fitts, 1250 Avenue of the Americas, New York, N. Y. *Program on page 125.*

JUNE 15-17, 1948 — Second University of Illinois Short Course on Hot Water and Steam Heating Systems, Urbana-Champaign, Ill. Course sponsored by university and I-B-R.

JUNE 20-24, 1948—Spring meeting, American Society of Heating and Ventilating Engineers, Mt. Washington Hotel, Bretton Woods, N. H. Secretary, A. V. Hutchinson, 51 Madison Ave., New York, N. Y.

JUNE 28, 1948 — Mid-year convention, National Heating Wholesalers Association, Edgewater Beach Hotel, Chicago, Ill. Richard M. Colegrove, executive secretary, 2130 Keith Building, Cleveland 15, Ohio.

JUNE 29-30, 1948 — Mid-year convention, National Warm Air Heating and Air Conditioning Association, Edgewater Beach Hotel, Chicago, Ill. Managing director, George Boeddener, 145 Public Sq., Cleveland 14, Ohio.

SEPTEMBER 13-17, 1948 — Third Instrument Conference and Exhibit, Convention Hall, Philadelphia, Pa. E. J. Grace, Jr., general chairman, Instrument Society of America, 1117 Wolfendale St., Pittsburgh 12, Pa.

DECEMBER 9-11, 1948 — Annual convention, American Society of Refrigerating Engineers, Hotel Statler, Washington, D. C. Secretary, M. C. Turpin, 40 West 40th St., New York 18, N. Y.

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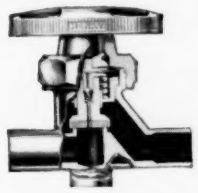

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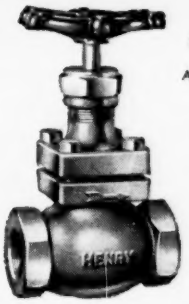

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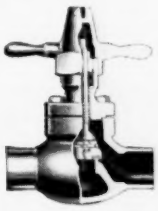

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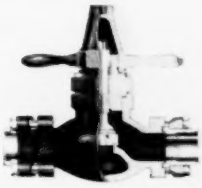

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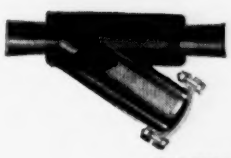

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RELIEF VALVES
Left: Ammonia Relief Valve
Below: Snap Action Relief Valve (Brass)

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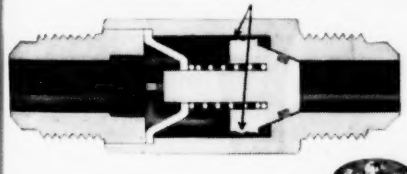
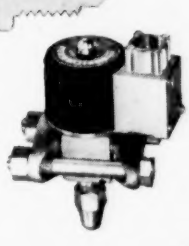


DRIER
Cartridge type with dispersion tube



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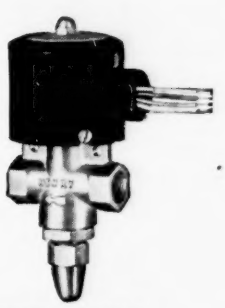

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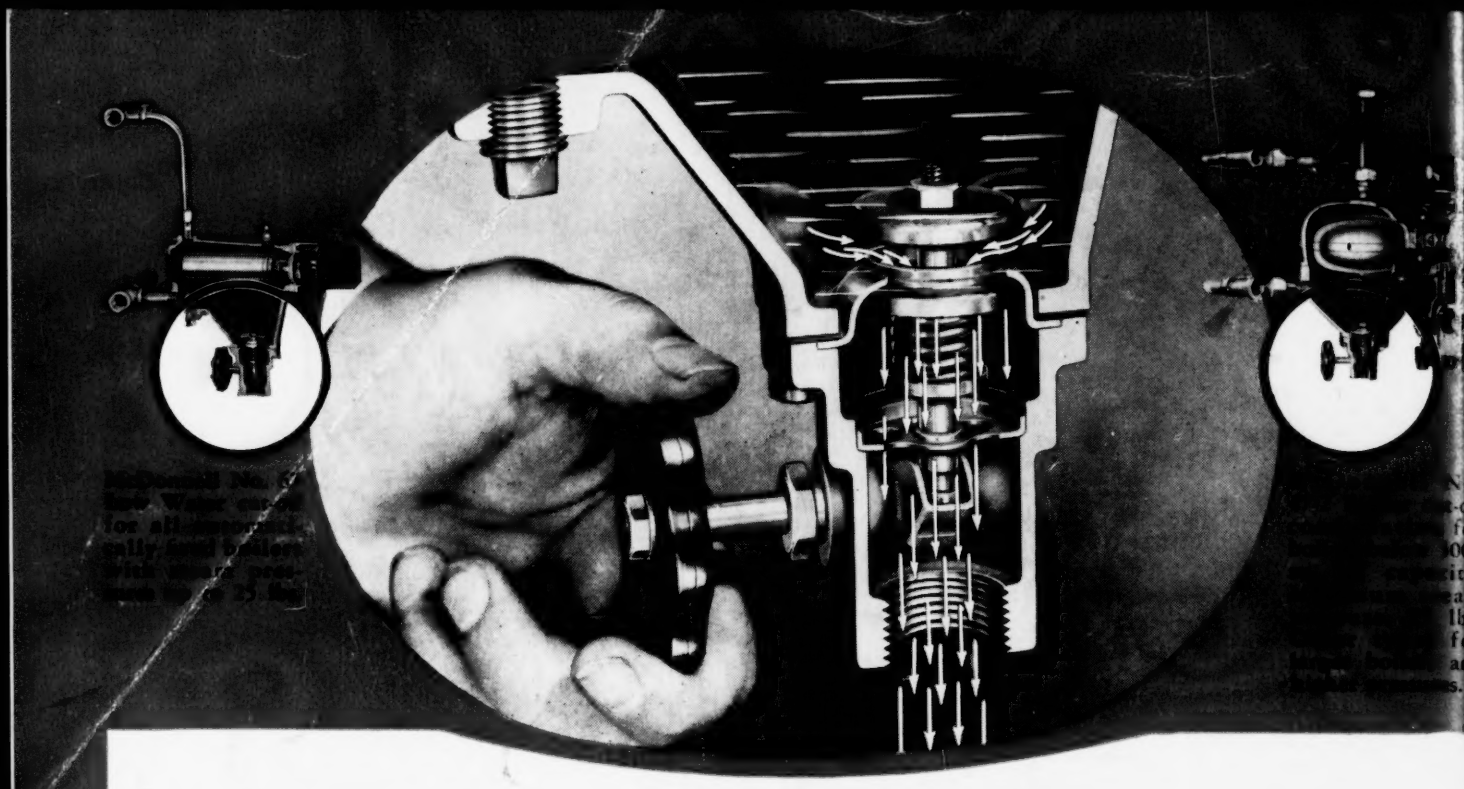

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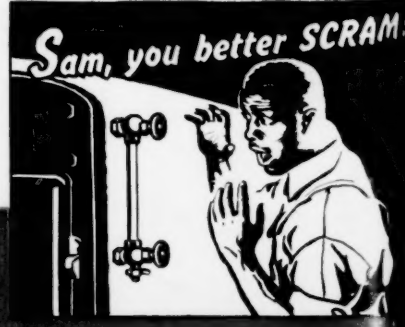

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